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Geology

ANNUAL REPORT

AND

TRANSACTIONS

OF THE

PLYMOUTH INSTITUTION

AND

Devon and Cornwall

NATURAL HISTORY SOCIETY.

VOL. VII. PART III.

1380-81.

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ANNUAL REPORT
OF THE
PLYMOUTH INSTITUTION

AND
Devon and Cornwall Natural History Society.

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OFFICERS OF THE INSTITUTION.

SESSION 1880-81.

President.

MR. J. BROOKING ROWE, F.S.A., F.L.S.

Vice-Presidents.

REV. PROFESSOR CHAPMAN, M.A.

DR. ROBERT OXLAND, F.O.S.

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Geology and Mineralogy—MR. F. J. WEBB.

Members of Council.

DR. WILLIAM H. PEARSE.

MR. R. N. WORTH, F.G.S.

Q. 11

Dr. J. H. H. H.

Dr. H. H. H.

Dr. H. H. H.

Dr. H. H. H.

LIST OF MEMBERS.

HONORARY MEMBERS.

Elected.	Name.	Address.
1865	Adams, J. C., D.C.L., F.R.A.S.	The Observatory, Cambridge.
1877	Beal, Rev. Professor, B.A., M.R.A.S.	Falstone Rectory, Northumberland.
1856	Coleridge, Rev. Derwent	Hanwell, Middlesex.
1874	Froude, James Anthony, M.A.	5, Onslow Gardens, London. W.
1859	Gibbs, F. W., C.B., 24, Mount Street,	Grosvenor Square, London.
1877	Günther, Dr. A., F.R.S., F.L.S., F.Z.S.,	British Museum, London.
1865	Lubbock, Sir John, Bart, D.C.L., F.R.S., F.L.S.,	High Elms, Kent.
1874	Pengelly, W., F.R.S., F.G.S.	Lamorna, Torquay.
1859	Scrivener, Rev. F. H. A., M.A., LL.D.	Hendon, Middlesex.
1875	Temple, Right Rev. Dr., Bishop of Exeter,	The Palace, Exeter.
1865	Vivian, Edward, M.A.	Torquay.
1872	Weymouth, R. F., D.LIT.	Mill Hill, London.
1872	Worth, R. N., F.G.S.	4, Seaton Avenue, Mutley.

LIFE MEMBERS.

1855	Alger, J.	Sydney, Australia.
1863	Alger, W. H.	Widey Court, near Plymouth.
1856	Bartlett, G.	Plymouth.
1857	White, James	London.

CORRESPONDING MEMBERS.

1856	Barham, C., M.D.	Truro.
1857	Blewett, Octavius	London.
1857	Boase, H. S., M.D., F.R.S., F.G.S.	Dundee.
1856	Harding, Col., F.G.S.	Upcott, Barnstaple.
1858	Ormerod, G. W., M.A., F.G.S.	Woodway, Teignmouth.
1858	Peach, C. W., A.L.S.	30, Haddington Place, Edinburgh.
1851	Towson, J. T.	Liverpool
1863	Vicary, W., F.G.S.	Exeter.

LECTURING MEMBERS.

1868	Adams, W.	Sussex Terrace.
1881	Aldridge, Charles, M.D.	Plympton House, Plympton.
1876	Amery, Fabyan	Druid, Ashburton.
1860	Anthony, Rev. Prof., M.A.,	Woodland Terrace.
1852	Bate, C. Spence, F.R.S.	Mulgrave Place.
1858	Balkwill, F. H.	5, Clarendon Place.
1863	Bennett, E. G.	Woodland Terrace.
1826	Bennett, J. N.	Windsor Villas.
1877	Bird, Rev. Benwell	Wychbury, Mannamead.
1861	Brent, Francis	19, Clarendon Place.
1862	Briggs, T. R. A., F.L.S.	Richmond Villa, Saltash Road.
1870	Briggs, Major J. A. J.	Richmond Villa, Saltash Road.
1851	Cater, Samuel	North Devon Place.

LECTURING MEMBERS—*continued.*

Elected.	Name.	Address.
1876	Chapman, Rev. Prof., M.A.	Western College, Mannamead.
1870	Clark, Philip	2, Mutley Park Terrace.
1880	Clarke, Edward, M.P., Huntingdon Lodge,	Peckham Road, London.
1853	Collier, Sir R. P.	Eaton Place, London.
1851	Collier, W. F.	Woodtown, Horrabridge.
1876	Collier, Miss Bertha Cycill	Woodtown, Horrabridge.
1876	Collier, Charles Calmady	Woodtown, Horrabridge.
1867	Collier, Robert	7, Chelsea Embankment, London.
1877	Coney, Rev. Thomas, M.A.	4, Wingfield Villas, Stoke.
1875	Cragoe, Thomas Adolphus, F.R.G.S.	Woodbury, Truro.
1880	Digby, William, C.I.E.	Hemerdon House, Mutley.
1874	Earle, The Ven. Archdeacon	The Vicarage, West Alvington, Kingsbridge.
1880	Eastlake, William	Buckland Terrace.
1880	Edmonds, Robert G.	Mount Drake.
1874	Fouracre, John T.	Chapel Street, Stonehouse.
1875	Fox, Francis E., B.A., F.R.G.S.	Uplands, Tamerton Foliot.
1868	Fox, R. R.	Westbrook, Tamerton.
1851	Harper, T., M.R.C.S.	1, Gibbon Street.
1852	Hine, James, F.R.I.B.A.	Mulgrave Place.
1867	Hingston, C. Albert, M.D.	2, Sussex Terrace.
1875	Hodge, Rev. J. M., M.A.	38, Tavistock Place.
1875	Hughes, R. H., M.A., M.B., M.R.C.S.	12, Lockyer Street.
1876	Inglis, James, C.E.	64, Emma Place, Stonehouse.
1881	Inskip, Capt. G., R.N., F.R.G.S.	Houndiscombe Place, North Road.
1868	Jackson, George, F.R.C.S.	1, Saint George's Terrace.
1851	Jago, George	Cobourg Street.
1851	Keys, I. W. N.	Whimble Street.
1870	Lewis, J. D., M.A.	30, Eaton Square, London. S.W.
1875	Lewis, Lewis, L.R.C.P. London	1, St. Michael's Terrace.
1873	Liscombe, Robert Lavers	Mount House, near Plymouth.
1880	MacIiver, P. Stewart, M.P.	Ardnave, Weston-super-Mare.
1874	Merrifield, John, Ph.D., F.R.A.S.	Gascoyne Place.
1862	Mitchell, Philip	Bedford Terrace.
1851	Moore, W. F.	The Friary.
1870	Morley, The Right Honourable the Earl of	
1861	Mount Edgcumbe, The Right Honourable the Earl of	
1878	Nield, Frederic, M.D.	6, Sussex Terrace.
1881	Odgers, William Ernest	9, Paradise Place, Stoke.
1874	Oxland, C.	Portland Square.
1851	Oxland, R., Ph.D., F.C.S.	Portland Square.
1871	Pearse, W. H., M.D.	1, Alfred Place.
1859	Prowse, A. P.	Yanadon, Horrabridge.
1880	Power, W.	Whitehall, Stonehouse.
1880	Reed, William Cash, M.D.	2, Athenæum Street.
1880	Rew, G. Gale	40, Torrington Place
1875	Rider, A., F.C.S.	4, Haddington Road, Stoke.
1857	Risk, Rev. J. Erskine, M.A.	Princess Square.
1861	Rowe, J. Brooking, F.S.A., F.L.S.	Lockyer Street.
1875	Sharman, Rev. W., F.G.S.	20, Headlands Park.
1860	Shelly, John	Princess Square.
1875	Smith, Robert	Bedford Street.
1867	Slater, D., M.A.	Cheveley Hall, Mannamead.
1869	Square, W., F.R.C.S., F.R.G.S.	Portland Square.
1874	Square, Elliot	Athenæum Terrace.
1881	Stephens, Henry	4, Buckland Terrace.
1876	Tippetts, G. E.	The Mount, Mannamead

LECTURING MEMBERS—*continued.*

Elected.	Name.	Address.
1865	Tweedy, W. Gage, B.A.	Athenæum Terrace
1875	Webb, F. J.	22, St. James's Place
1875	Weekes, Samuel	Sussex Terrace
1876	Windeatt, Edward	Totnes
1873	Woolcombe, R. W.	St. Jean D'Acre Terrace, Stoke.
1879	Worth, R. N., F.G.S.	4, Seaton Avenue, Mutley.
1878	Wright, W. H. K.	7, Headlands Park.
1873	Young, Sir George, Bart.	15, Hyde Park Gate, Lond. S W.

"The property of the Institution, the election of members, management of the concerns, and enactment of laws, are vested exclusively in the Lecturing Members."—Law 2.

ASSOCIATES.

Allport, S., 48, North Street	Elliott, Joseph, 3, Clarendon Place
Alty, Henry, Radnor Place	Elliott, E., Lockyer Street
Autridge, Rev. F. C., R.N., 2, Belmont Villas, Stoke	Ellen, J. B., 14, The Crescent
Barrett, G. R., Bank of England Place	Evans, H. M., South Devon Place
Barrett, J., 8, Staddon Terrace	Foster, J. B., 4, Cambridge Street
Bayly, John, Seven Trees	Fowler, F. F., Elm Road, Mannamead
Bayly, Robert, Torr Grove, near Plymouth	Francis, H., 22, Ker St., Devonport
Bazeley, William, Princess Square	Freeman, Francis Ford, Blackfriars House
Beck, W. C., R.N., 12, Paradise Row, Stoke	Gale, Dr. J., M.A., F.G.S., F.C.S., 2, Alton Terrace
Beechey, Admiral, R.N., St. James's Place	Geake, Edward, Eglington Villas, Mannamead
Bellamy, G. D., Endsleigh Place	Gibbons, Wm., 35, Tavistock Place
Bennett, John, Princess Square	Goulding, F. H., George Street
Bignell, George C., M.E.S., 8, Clarence Place, Stonehouse	Goad, J., 1, Buckingham Place, Stonehouse
Body, Thomas, 75, Cobourg Street	Greenlaw, William, Lipson Cottage, Plymouth
Bond, A. James, 6, Gascoyne Place	Groser, Albert, North Hill Villa
Brendon, W. Turner, George Street	Haldane, Alex., 10, Athenæum Place
Bridson, H., Warfleet, Dartmouth	Hall, Frederick, George Street
Brittain, C. E., 7, Woodside	Hall, Rev. I. H., M.A., Albany Place
Brown, J. H., Woolster Street	Harris, Henry Vigurs, Union Street
Brown, George H., Mill Lane	Harvey, J., Princess Square
Brown, Henry, North Hill House	Heath, William, George Street
Browning, F., Priory Cottage, Compton	Header, W., Union Street
Bull, Frederick, 7, Brunswick Terrace	Hendry, A. T., 15, St. James's Terrace
Cawse, Henry, Old Town Street	Hicks, Francis, Burrington Park
Chalker, John P., Crescent Place	Hoppen, Vosper, George Street
Clark, W., Thorn Park Villas	Hubbard, G., Ford Park, Mutley
Cole, A., Bedford Street	Jago, C. S., Cobourg Street
Collins, John Ballard, 27, Torrington Place	Jago, Edward, 6, Athenæum Terrace
Compton, C. E., 2, Mutley Park Ter.	James, W. C., J.P., 6, Glenside, Mannamead
Cox, G., Manor Office, Stonehouse	James, E. H., Woodside
Deacon, Josiah, 45, Durnford Street, Stonehouse	James, Edward, Greenbank
Derry, Wm., Houndiscombe House	James, Capt., R. W. Yacht Club
Deutsch, Herr, 5, Crescent Place	Jameson, Dr., Compton Park House, Mannamead
Diment, Thomas, Laira House	Jones, Dr. C. Marchant, St. Andrew's Terrace

ASSOCIATES—*continued.*

Keen, Henry, St. James's Terrace	Rice, J., Athenæum Street
Kendall, Miss A. C., Plymouth High School	Rees, James, 1, Citadel Terrace, Citadel Road
Kerswell, Alfred J., Ham Street	Searle, G. W., 4, Meadfoot Avenue, Mutley
Kerswill, F. J., Frankfort Street	Serpell, E. W., 19, Hill Park Crescent
King, William, Hoe House	Shelly, Arthur, 23, Woodland Terrace
Latimer, Alfred, Glen View, Manna-mead	Smith, A. Bentley, Valletort Place, Stoke
Luscombe, H. A., 35, Clifton Place	Snell, H. B., 92, Union Street
Manton, Wm., Alexandra Place, Mutley	Soltau, G. W., Little Efford Square, Wm. Joseph, F.R.C.S., Portland Square
Martin, W. L., Windsor Villas	Stephenson, G., Old Town Street
Mitchell, T., Eton Villas	Stephenson, R., National and Provincial Bank of England, Devpt.
Morrish, F. A., 2, Bedford Terrace	Stribley, Edwin, 3, Ford Park
Morris, Charles, 4, Edgcombe Place, Stonehouse	Tanner, C. F., Mutley House
Norman, John G., Sea View, Lipson Road	Taylor, J., 37, Flora Street
Opie, E., 5, Braidwood Terrace	Thomson, Lewis C., Hillsborough, Mannamead
Payne, James, 21, Clarendon Place	Tucker, G. L., 9, Bedford Terrace
Pearse, Miss Alice, 8, Alton Terrace	Walkem, W. L., Emma Place, Stonehouse
Pearse, T., M.D., Flora Place	Watson, G. F., 42, Durnford Street, Stonehouse
Pearse, S., Royal Hotel	Westlake, T. H., Torrington Place
Penson, James, Boon's Place	Wheeler, Rev. H., 41, Tavistock Place
Pethybridge, H. M., Frankfort Chambers	Widger, James, 14, Tavistock Street
Philips, G., 1, Victoria Place, Stonehouse	Williams, C. D., Byron Villa, Admiral's Hard, Stonehouse
Picken, Samuel, Hill Park Crescent	Williams, C. E., Plympton
Pike, W. H., Clock Tower Chambers, George Street,	Willoughby, J., 11, Seaton Terrace
Pinwell, Capt. Treharne, Truro	Wilson, J. Walter, Hoe Park Terrace
Plummer, Thomas, 9, Westwell Street	Wills, J. C., 68, Durnford Street, Stonehouse
Polkinghorne, E., Eliot Terrace	Windeatt, John, Woodland House
Prance, H. Penrose, 7, Athenæum Terrace	Woodhouse, Henri B. S., 15, Portland Square
Preston, H., Old Town Street	
Pridham, Edward, 10, Princess Square	
Radford, C. H., 37, Bedford Street	
Randle, J., Union Street	

LADY ASSOCIATES.

Borland, Mrs. R., Emma Place, Stonehouse	Pomeroy, Miss H., 1, Edgcombe St., Stonehouse
Cooper, Miss Agnes, 10, Molesworth Terrace, Stoke	Pomeroy, Miss S., 1, Edgcombe St., Stonehouse
Issanchon, Mdlle., 1, Leigham Terrace	Rumble, Miss, Courtenay Street
Minhinnick, Miss E. M., Gascoyne Place	Treeby, Mrs., 297, North Road
Parker, Miss S., Torrington House	Twose, Mrs., 4, Clarendon Place
Pomeroy, Mrs., 1, Edgcombe Street, Stonehouse	Waghorn, Miss, 38, Portland Square

JUNIOR ASSOCIATES.

Body, Frederick, 5, Lockyer Street
Coad, jun., John Laskey, 26, Endsleigh Place

THE SECRETARIES' REPORT.

1880-81.

THE Secretaries present the following Report of the Proceedings of the Session, and have to congratulate the members on the flourishing condition of the Society at the present time. Never during its existence were so many members and associates upon its lists, and never have the meetings been so well attended as during this session, the average attendance having been ninety-six, whilst most of the papers were ably discussed.

The papers read were as follows ; viz. :

1880.

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| Oct. 7. | Conversazione | |
| „ 14. | Some Phases of Indian and
Anglo-Indian Life . . | Mr. JAMES ROUTLEDGE. |
| „ 21. | The Decimal System of Weights,
Measures, and Coinage . | Mr. G. GALE REW. |
| „ 28. | Lord Macaulay | Mr. T. A. CRAGOE, F.R.G.S. |
| Nov. 4 | Technical Education . . | Mr. J. C. INGLIS, C E. |
| „ 11. | English Merchant Shipping
Legislation | Mr. R. G. EDMONDS. |
| „ 18. | Plymouth: Its Progress and
Prospects | Mr. W. H. K. WRIGHT. |
| „ 25. | Modern Literary Style . . | Rev. BENWELL BIRD. |
| Dec. 2. | Bleaching Agents | Mr. A. RIDER, F.C.S. |
| „ 9. | The Great Map of Palestine . | Mr. J. SHELLY. |
| „ 16. | Pythagoras | Rev. PROFESSOR CHAPMAN, M.A. |
| „ 23. | The Hygiene of Occupation . | Mr. G. JACKSON, F.R.C.S. |

1881.

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| Jan. 13. | Conversazione | |
| „ 20. | Overcrowding: How it can best
be dealt with in Plymouth | Mr. W. E. ODGERS. |
| „ 27. | Samuel Cook: His Life and
Works | Mr. WILLIAM EASTLAKE. |
| Feb. 3. | The Depths of the Ocean . | Capt. INSKIP, R.N., F.R.G.S. |

Feb. 10.	Environment or Habitation? A Chapter in the Theory of Evolution . . .	Mr. F. H. BALKWILL.
„ 17.	The Meteorology and Climate of Plymouth . . .	Dr. MERRIFIELD, F.R.A.S.
„ 24.	The Fossil Type of Man, in the Past and Present . .	Rev. J. ERSKINE RISK, M.A.
Mar. 3.	Louis XIV. and his Age . .	Mr. D. SLATER, M.A.
„ 10.	Professional Experiences . .	Mr. J. N. BENNETT.
„ 17.	On Criminal Responsibility . .	Mr. W. SQUARE, F.R.C.S., F.R.G.S.
„ 24.	Sir Francis Drake and the Plymouth Corporation . .	Mr. R. N. WORTH, F.G.S.
„ 31.	Notes on Charles Kingsley . .	Mr. W. PENGELLY, F.R.S., F.G.S.

The whole of the Lectures announced on the cards were read and discussed, and in addition to these Mr. R. N. Worth read a paper on “Sir Francis Drake and the Plymouth Corporation,” which excited much interest.

Eleven lecturing members, twenty-nine associates, two lady associates, and two junior associates, have joined the Society during the year, the numbers now on the lists being seventy-six lecturing members, one hundred and twenty-eight associates, twelve lady associates, and two junior associates.

The Society has to regret the loss, by death, of one of its lecturing members;—the sad fate of Mr. Elliot Square must be in the memory of us all.

On the 10th April, 1880, the members and associates dined together at the Royal Hotel, when about seventy gentlemen were present.

The anniversary meeting was held on the 3rd May; during the evening the following short papers were read; viz.:

“Traces of the Siege of Plymouth at St. Budeaux and elsewhere” . . .	Mr. R. N. WORTH, F.G.S.
“On some Flint Flakes, etc., from Devon and Cornwall,” recently presented to the Society by the Secretary . . .	Mr. FRANCIS BRENT.

At this meeting it was resolved, “That at the town public meeting, to be held at the Guildhall on Friday, 7th May, to consider a proposal to erect a high-level bridge from below the Camera on the Hoe, an amendment should be moved by Mr. C. Spence Bate and Mr. Pike.” This amendment was carried by a large majority.

The annual excursion was held on the 1st July, when a large party of the members and associates with their friends, including many ladies, spent a most enjoyable day on Dartmoor, visiting Two Bridges, Wistman's Wood, Crockern Tor, &c. At the latter place Mr. E. G. Bennett gave some account of the Althings and Stannary Courts that were held there in former days, and pointed out the rocks which were said to have been used as seats and a table at such assemblies. The weather proved unexceptional, and the party returned to the Bedford Hotel, Tavistock, where tea was partaken of.

On the 22nd July a Field Meeting was held at Plympton, at which upwards of sixty ladies and gentlemen were present. The recently discovered site of Plympton Priory was explained by the President, who also read to the party assembled within the base court of the Keep an interesting paper on "Plympton Castle." The architecture of the churches of Plympton St. Mary and Plympton Erle was explained by Mr. James Hine, F.R.I.B.A. The party was most hospitably entertained by the President and Mrs. Rowe at afternoon tea, in the Guildhall of the ancient borough town. Before returning to the carriages a visit was paid to Plympton House, where Dr. Aldridge kindly pointed out a grand staircase of the time of Queen Anne, and the dairy still inlaid with Dutch tiles of an early date.

The Lecture Season was opened with a *Conversazione* on the 7th October, 1880, when a message from the President, who was prevented by illness from attending, was read by the Secretary. The Arts Club having just closed their exhibition of paintings, which had been attended with success, kindly permitted their works to remain on the walls of the hall; these added much to the enjoyment of the party assembled. A portion of the band of the Royal Marines played selections of instrumental music during the evening.

A second *Conversazione*, which was largely attended, was held on the 13th January, 1881, and was almost entirely devoted to music, and, under the leadership of Mr. F. N. Löhr;—Messrs. Wm. Square and Bellamy, Miss A. Dwelley, Miss Burdwood, and Miss Annie Hubbard, gave some choice pieces of vocal and instrumental music, which were skilfully rendered. During the evening a paper was read by Mr. R. N. Worth, F.G.S., on the "Portrait of Sir Francis Drake," the property of the Corporation, and kindly lent

by the Worshipful the Mayor; and on a "Portrait," on panel, presumably that of Sir John Hawkins, that had lately been exhumed from a broker's shop by Dr. Jago, and lent by that gentleman previous to its presentation to the Corporation. A paper was read by Mr. Francis Brent "On the Recent Discovery of an Early Roman Grave in Stillman Street, Plymouth." The grave was hewn in the solid rock, was covered by two slabs of dunstone, and contained a large urn of lustre ware, which unfortunately was destroyed. On the tables were many books of early date, and some valuable prints and manuscripts, some of them having reference to "Old Plymouth." There were also exhibited a rare illuminated Missal of the 12th century, lent by Mr. H. J. Snell; and a valuable Chinese manuscript taken from the Summer Palace at Pekin, and illustrated with Portraits of some of the descendants of Confucius, lent by the Secretary.

On the 17th November, 1880, a special meeting of the members and associates was held, when a committee was appointed to meet the committee of the Town Council, to consider the best means of celebrating the tercentenary of Sir Francis Drake.

The resolution of the members assembled at the annual meeting on the 1st April, 1880, on the recommendation of the Council, that a committee should be appointed to take into consideration the desirability of providing additional Museum accommodation was carried out, and during the year the committee so appointed have, with the Council, given serious consideration to the matter. Plans have been prepared by Messrs. Hine and Odgers, and an estimate of cost drawn up for providing a building to contain a Museum, Fine Art Gallery, &c.

The Curator of the Library reports :

"During the past year many volumes in continuation of sets of works on the shelves have been bound and placed with preceding volumes.

"The following publications have been received from their respective societies, mostly in exchange for the 'Transactions' of the Institution : Berwickshire—'Proceedings of Naturalists' Field Club,' vol. ix. part 1. Bristol—'Proceedings of the Naturalists' Society,' vol. iii. part 1. Cornwall—'Transactions of the Royal Geological Society,' vol. x. parts 1, 2; 'Journal of the Royal Institution,' Nos. xxii., xxiii.; 'Royal Polytechnic Society's Forty-

seventh Annual Report.' Devon—'Transactions of the Devonshire Association,' vol. xii. Dublin—'Journal of the Royal Dublin Society,' No. xlv.; 'Scientific Proceedings,' vols. i. ii. (parts 1-6); 'Scientific Transactions,' vols. i. ii. (parts 1, 2); 'Journal of the Royal Geological Society of Ireland,' vol. xv. part 3. Edinburgh—'Transactions and Proceedings of the Botanical Society,' vol. xiv. part 1; 'Report on Temperatures during 1878-79, at Royal Botanic Garden, by John Sadler.' Essex—'Inaugural Address at Meeting of Epping Forest and Essex Naturalists' Field Club, 1880, Transactions,' parts 1, 2, 3. Glasgow—'Proceedings of Natural History Society,' vol. iv. part 1. London—'Report of British Association, 1880;' 'Proceedings of Geologists' Association,' vol. vi. parts 5-9; 'Quarterly Journal of the Geological Society,' Nos. 142-144; 'Journal of the Royal Microscopical Society,' vol. ii. part 2, vol. iii. part 1-3; 'Proceedings of the Zoological Society,' part 4, 1879; parts 1-3, 1880; 'List of Animals in the Gardens,' first supplement, 1879; 'Catalogue of Library,' 1880. Manchester—'Memoirs of the Manchester Literary and Philosophical Society,' vol. xvi.; 'Proceedings,' vols. xvi.-xix. Norfolk—'Transactions of the Norfolk and Norwich Natural History Society,' vol. iii. part 1. Northumberland and Durham—'Transactions of the Tyneside Field Club,' vol. vii. part 2. Plymouth—'Report of Free Library.' Sydney, New South Wales—'Journal of the Royal Society,' vol. xiii.; 'Liversidge's Report on Museums;' 'Annual Reports on Mines,' 1878, 1879, with maps. Tasmania—'Proceedings and Report of Royal Society,' 1878. Taunton—'Proceedings of Somersetshire Archaeological and Natural History Society,' vol. v. N.S. Tuscany—'Atti della Società Toscana,' vol. iv. fasc. 2. United States—'Annual Report of the Geological and Geographical Survey of the Territories,' 1877, from Dr. F. V. Hayden, United States Geologist; 'United States Survey,' vol. xii.; 'Leidy's Fresh-water Rhizopods of North America;' 'Allen's History of North American Pinnipeds;' 'Bulletin of United States Survey,' No. 4 vol. v.; 'Smithsonian Institution Report,' 1878.

"There have also been presented: 'Gmelin's Linnæus's System of Natural History,' 2 vols., by Mr. F. Brent. 'Sixteenth Annual Report of Committee for Exploring Kent's Cavern,' by Mr. W. Pengelly. 'Davis on Heaves and Faults,' by the author. 'Flora of Plymouth,' 'Proceedings of Linnæan Society—Zoology' for the current year, by Mr. T. R. A. Briggs.

"The following works have been purchased: 'Monograph of the British Copepoda,' by Brady, vols. ii. iii.—Ray Society, 1880. 'Palæontographical Society,' vol. xxxiv., 1880; 'Rodd's Birds of Cornwall;,' 'Flora of Plymouth.' 'Desfontaine's Mémoire sur quelques nouvelles espèces d'oiseaux des côtes de Barbarie;,' 'Sir Andrew Smith's Miscellaneous Ornithological Papers'—Willughby Society. 'Zoological Record,' 1877; 'Gordon's Treatise on Electricity and Magnetism,' 2 vols.; 'Croll's Climate and Time;,' 'Transactions of the Linnæan Society,' vol. ix.; 'Darwin's Power of Movement in Plants;,' 'Wallace's Island Life.' 'The Lay Folks' Mass Book;,' 'The Blickley Homilies of Tenth Century,' part 3; 'Unprinted English Works of Wyclif;,' 'The English Charlemagne Romances,' parts 2 and 3—Early English Text Society. 'Report on *Challenger* Exploration,' vol. i.; 'Dohrn's Fauna and Flora of Bay of Naples,' 2 parts; 'Newton's Yarrell's British Birds,' part 13.

"The following serials are at present supplied: 'Annales des Sciences Naturelles—Zoologie,' 'Zoologist,' 'Ibis,' 'Entomologist,' 'Entomologists' Monthly Magazine,' 'Journal of Anatomy and Physiology,' 'Journal of Botany,' 'Annals and Magazine of Natural History,' 'Geological Magazine,' 'American Naturalist,' 'American Journal of Science and Arts,' 'Quarterly Journal of Science,' 'Philosophical Magazine,' 'Mind,' 'Microscopical Journal,' 'Nature.' Murchison's 'Silurian System' is at present mislaid."

The Curator of Fine Arts reports:

"Your Curator has to report that the affiliated Society of the Plymouth Art Club held an exhibition of oil and water-colour paintings in this hall in the month of September last. It was so arranged that the annual *Conversazione*, given at the commencement of the session of this Institution, took place immediately before the close of the exhibition, whilst the paintings were still upon the walls. With very few exceptions all the local artists were represented, and the display may be considered a very fair average of the state of the Fine Arts in Plymouth.

"The time for preparation being short, not many of the artists put out their real strength; but so successful was the exhibition in every way, that there will be another held in the coming autumn. On the night of the *Conversazione* the hall was crowded with members and their friends, who expressed every satisfaction at seeing such a valuable collection brought together. Some members

of the Royal Marine Band were engaged to perform selected pieces of music. Another interesting *Conversazione* was held at the opening of the new year, at which old books were the chief feature. Many of these were profusely illustrated. There were also a number of fine old engravings and etchings shown, and two pictures, portraits of Sir John Hawkins and Sir Francis Drake, were kindly lent—the one by Dr. Jago, the other by his Worship the Mayor—of no great value as works of art, but interesting to the antiquary. A vocal and instrumental concert was arranged by one of our members, Mr. William Square, aided by Miss A. Dwelley, Miss Burdwood, Miss A. Hubbard, and Mr. Bellamy, the whole conducted by Mr. Löhr. The programme was well selected, and the performance called forth continued applause from a most attentive audience.

“No pictures, drawings, or other art objects have been added by presentation to the Institution. The pictures in the hall have been sorely tried by the severity of the past winter. Wet walls and the intense heat of the gas, without sufficient ventilation, are silently working the premature decay of the older pictures, whilst the light and heat of the summer are doing great mischief to them all. This calls for some immediate remedy.

“A lecture on the life and works of the late Samuel Cook, delivered by Mr. William Eastlake, excited deep interest in a large audience, many of the members having personally known him, and some having enjoyed his friendship. The discussion after the lecture was a series of affectionate tributes to his memory; and it is hoped that this paper will be fully recorded in the Annals of this Institution, forming a fitting companion to the Life of Samuel Prout, a life seemingly uneventful, but full of modesty, humility, and great self-denial, loving art for its own sake—a true example for the youth of the present day.”

The Curator for Geology and Mineralogy reports :

“During the past year the Stonehouse Battery Hill has a second time yielded a very considerable osseous deposit, which, like its predecessor, has been presented to the Institution Museum.

“The present is a very valuable, and in some respects unique, series of fossils. The complete description and enumeration, together with the geological conditions under which the series has been found, forms the subject of an independent paper by Mr. R. N. Worth, F.G.S.

"The series includes the only remains of reindeer (*Cervus tarandus*) ever found in this locality ; also of a small rodent hitherto unidentified, somewhat resembling the lemming ; the teeth and bones of the woolly rhinoceros (*tichorhinus*), bear (probably *ferox*), hyæna (*spelæus*), horse (*fossilis*), wolf, fox, wild cat, hog (*scrofa*) sheep or goat, red deer, other cervine remains which appear attributable to roe deer, various bovine species (*Bos primigenius* and *B. longifrons* certainly, *Bison priscus* probably), dog, hare, with some smaller and more fragmentary remains not yet named.

"The Society is also indebted to Captain Daubeney for the presentation of the tooth of a whale, found in connection with the Raised Beach on the Hoe about 1838-9, at the same time as the whale vertebra previously in the Museum. The tooth is a long irregular ovoid, tapering to both ends and slightly arched, its length in the straight being $6\frac{3}{16}$ inches. The root end is perfect, the crown broken on one side, and a little worn. The original length in the straight did not exceed 7 inches. The length over the outside curve from the centre of the base to the centre of point is $8\frac{1}{16}$, while the inside curve between the same points is $7\frac{4}{16}$. The greatest girth is 7 inches ; girth at base immediately above root opening, $3\frac{4}{16}$ inches ; at an inch from point, $5\frac{2}{16}$ inches. The section is elliptical, and at its greatest breadth, which is 3 inches from the point, its transverse diameter is $2\frac{5}{16}$ inches, and the conjugate $2\frac{1}{16}$.

"From St. George's Hall Quarry Mr. Hine has presented a specimen of *Atrypa reticularis*.

"The only addition to the mineralogical collection is a very fine example of *Scheelite* (Ca WO_4) from Huel Friendship, presented by Dr. Merrifield.

The Curator of Antiquities reports :

"A fine block of 'Jews tin,' found in digging in his grounds, has been presented to the Institution by Mr. Pode, of Slade."

FRANCIS BRENT, }
JAMES C. INGLIS, } *Hon. Secs.*

BALANCE SHEET

OF

The Plymouth Institution and Debon and Cornwall Natural History Society.

For the Year ending 31st March, 1881.

	£	s.	d.		£	s.	d.
By Annual Subscriptions, at 21/-	.	.	206 17 0	To Library and Binding	.	.	35 5 11
" " at 10/6	.	.	8 8 0	Lighting and Warming	.	.	11 5 5
Arrears of Subscriptions	.	.	6 6 0	Salaries and Commission	.	.	21 6 11
Rent of Hall	.	.	15 19 6	Interest	.	.	6 14 4
Balance	.	.	7 5 2	Repairs	.	.	9 16 4
				Taxes and Insurance	.	.	5 9 6
				Reports	.	.	77 10 6
				Conversazione	.	.	9 18 9
				Petty Disbursements	.	.	10 18 4
				Stationery, Printing, &c.	.	.	10 6 0
				Balance last year	.	.	46 3 8
							<u>£244 15 8</u>
							<u>£244 15 8</u>
				Balance	.	.	7 5 2

We have examined the foregoing Accounts and Balance Sheet, and have compared them with the Vouchers, and find the same correct.

(Signed) SAML. CATER, } Treasurers.
E. G. BENNETT, }

(Signed) G. GALE REW, } Auditors.
G. E. TIPPETTS, }

Dated this 2nd day of April, 1881.

An ABSTRACT from the METEOROLOGICAL REGISTER, from 1st January, 1880, to 31st December, 1880, kept at the Navigation School, Gascoigne Place, Plymouth (Lat. $50^{\circ} 22\frac{1}{2}'$ N., Long. $4^{\circ} 7\frac{1}{4}'$ W.), by JOHN MERRIFIELD, LL.D., F.R.A.S., F.M.S.

MONTH.	BAROMETRICAL PRESSURE REDUCED TO MEAN SEA LEVEL AT 32° FAH.			TEMPERATURE.			HYGROMETER.				RAINFALL.		DIRECTION OF WIND AT 8 A.M.				
	Average Barometer for Month.	Maximum for Month.	Minimum for Month.	Average Maximum in shade.	Average Minimum.	Average temperature.	Average dry Bulb.	Average wet Bulb.	Average dew Point.	Average humidity, saturation, 100.	No. of days on which not less than 0.1 in. fell.	Quantity for the month in inches.	From N. by E. to E.	From E. by S. to S.	From S. by W. to W.	From W. by N. to N.	Calm.
1880																	
January .	30.347	30.615	29.961	42.32	33.75	38.04	36.61	35.57	34.06	91	7	.76	14	5	4	3	5
February .	29.789	30.510	28.726	50.44	39.61	45.03	43.46	42.77	41.95	95	21	3.04	2	5	11	2	9
March .	30.068	30.380	29.463	52.71	41.75	47.23	44.99	43.27	41.27	87	13	1.77	18	5	5	1	2
April .	29.869	30.413	29.329	54.74	43.32	49.03	47.20	44.63	41.75	82	11	2.30	9	4	8	9	0
May .	30.093	30.509	29.724	62.40	46.29	54.35	53.25	49.21	45.17	74	6	1.11	14	4	3	8	2
June .	29.936	30.297	29.529	64.23	51.58	57.91	57.47	54.62	52.03	82	16	1.16	5	8	7	10	0
July .	29.914	30.240	29.482	67.75	55.19	61.47	60.61	58.41	56.50	87	19	3.11	1	5	12	5	8
August .	29.992	30.305	29.606	70.27	57.86	64.07	62.70	59.94	57.59	83	8	.63	16	2	2	4	7
September .	29.985	30.454	29.424	65.27	54.03	59.65	58.49	57.32	56.27	92	17	3.55	3	6	6	6	9
October .	29.843	30.393	28.840	54.53	41.57	48.05	45.42	44.13	42.65	90	17	4.51	14	2	3	3	9
November .	29.975	30.446	28.898	50.97	40.20	45.58	44.19	42.98	41.55	90	15	2.82	7	0	15	3	5
December .	29.970	30.643	29.274	51.24	42.42	46.83	45.93	44.90	43.73	92	19	4.14	4	1	14	6	6
Average for 1880	29.982	30.434	29.355	57.24	45.63	51.44	50.03	48.15	46.21	87	169	28.90	107	47	90	60	62
Average for 16 Years .	29.948	30.408	29.323	58.18	45.05	51.62	50.82	48.91	46.92	87	182.8	37.00	78.24	64.48	106.33	84.30	32.06

The observations are all made at eight a.m. The Rain Gauge is by Casella, and is 8 inches in diameter; its top 9 feet 2 inches above the ground, and 75 feet above the mean level of the sea. A rainy day is one in which not less than 1.100th of an inch falls. The instruments have all been supplied by the Meteorological Committee of the Royal Society, compared at Kew, and the index error supplied to each.

MESSAGE FROM THE PRESIDENT

AT THE OPENING OF THE SESSION.

(Read October 7th, 1880.)

ALTHOUGH the Council has been good enough to relieve me from the necessity of delivering the usual inaugural address, I cannot allow this evening to pass without expressing my regret that I am unable to be with you and to discharge my duty as President. I have not been absent from the Athenæum on the first Thursday evening in October for many years, and it is no light thing that prevents my attending to-night.

I had pretty well arranged the subject matter of my address, but my illness prevented my writing it, and perhaps I may be allowed to give very briefly the heads of what I intended saying, as I fear that I shall be unable to do anything more than this during the session.

I was desirous, in the first place, of referring to Darwinism, and occupying some little time in contrasting the position in which it now stands with what was known of it at no very distant period. A favourable time for such a review presents itself just now ; for it was just twenty-one years ago last week that "*The Origin of Species*" was given to the world. During the period that has since elapsed science has made rapid advances, and a considerable amount of evidence, either for or against the theory, and bearing more or less upon the arguments adduced by the great scientist, must necessarily have accumulated. Some of this evidence I proposed dealing with. Palæontological discoveries, and embryological investigations, have not, I think, in any way shaken the theory of Darwin, and the twenty-first birthday of his book finds its author accumulating facts in support of his great work, which almost every discovery tends to strengthen and none to disprove,

and in a position which his followers believe unassailable, and which his opponents find it daily more difficult to attack. As recently pointed out, like geology, and the antiquity of man, "the whole question has been now lifted out of the domains of theology, and become mere matter for scientific proof," and time in this, as in other things, has worked wonders.

Secondly, I wished to refer again to the question of a Museum. Except by our own Society and by individuals, no notice has been taken of the remarks I made in my last year's address, and the importance of the subject as regards the welfare of our fellow-townsmen I thought would warrant me in again urging the necessity of taking some immediate steps to provide what is so much required. I do not see the slightest chance of anything being done by the town at large, and whatever is done the initiative will have to be taken by a Society such as ours. Some effort ought to be made by the few to provide what the many will profit by ; and if a museum on a large scale cannot be undertaken, the best substitute attainable must suffice until public action is aroused in this direction, and a building on a scale commensurate with the size and importance of the town is demanded. Failing anything better, the Committee appointed at the last Annual Meeting of the Society has carefully considered the best means of obtaining additional space for the display of our collections, and decided that a wing or annex on the western side of the Athenæum will be the easiest and least expensive plan. With the assistance of the curator of the building, Mr. Hine, plans have been prepared, and this scheme has been approved by the Council, and will be brought before the Members in due course. Assuming this building to be erected, I proposed pointing out how it might be made most useful and best arranged, not only as a local Museum (the primary want) on a small scale, but also as a small typical Museum for reference and study. The proposed building will be a very useful one no doubt ; but I regret that something more important cannot be undertaken. I trust, however, whatever plan may be eventually submitted to the Members and Associates, and through them to the public, that it may receive hearty support, and that the Council will be encouraged to persevere to a satisfactory conclusion in the effort which it considers of so much importance. Unfortunately the plan now suggested will not provide for a Picture Gallery, or a gallery for art exhibitions. I

believe that if wall space could be found many important works of art would find their way to the Athenæum. That Plymouth has no Picture Gallery is not one whit less creditable to it than that it has no public Museum.*

Thirdly, I wished to say a few words on art matters and on matters archæological, both untouched in my address last year, and especially to refer to the Exhibition of the Plymouth Art Club.

Fourthly, a want which appears to be a growing one is that of a magazine devoted to local topics—literary, scientific, and artistic. A magazine for the counties of Devon and Cornwall ought to find sufficient support to ensure its being successfully carried on. A distinguished Member of our Society has suggested that the transactions of all local societies might be amalgamated, so that the members of a society in one district might be acquainted with what was doing in another. I do not know how this could be satisfactorily arranged; but in a magazine such as I have suggested reports of the proceedings of all societies would find a place.

These were the principal topics on which I proposed enlarging. The publication of the work of our esteemed Member, Mr. T. R. Archer Briggs, *The Flora of Plymouth*, a most valuable contribution to local natural history, would have been entitled to notice; and a reference to the life and work as an ornithologist of Mr. Edward Hearle Rodd, the only Member whose loss we have had to deplore during the last year, and to his posthumous book, *The Birds of Cornwall*, would necessarily have found a place.

* The plans prepared by Messrs. Hine and Odgers have been since altered, so as to include a Picture Gallery the size of the present Lecture Hall.

SOME PHASES OF INDIAN AND ANGLO-INDIAN LIFE.

SYLLABUS OF LECTURE BY MR. JAMES ROUTLEDGE.

(Read October 14th, 1880.)

THE "*surprises*" of Indian life. Successive waves of conquest. A glimpse of an earlier and a happier time. The arrival of Francis Drake in Plymouth, three hundred years ago. Lord Mayo's generous and great rule. Personal recollections of Lord Mayo. His death and character. Visits to the great cities of the Ganges and Jumna. The scenes of the Mutiny. English graves in India. Faiths and festivals in native India. Missions and missionaries. Indian finance. The Civil Service. Parliamentary interference in India.

DECIMAL WEIGHTS, MEASURES, AND COINAGE.

SYLLABUS OF LECTURE BY MR. G. GALE REW.

(Read October 21st, 1880.)

INTRODUCTION. Ancient writers on the subject. Abstract numbers the true basis. One scale hitherto only used. Fingers used in calculation. Object of arithmetic. Our present units unwieldy. Statistical calculations most difficult. Acquaintance with the table-book. The various units in use have not the slightest connection with each other. A question asked. The position of other countries. Metric system. Eleven words the key to the whole

system. An example, illustrated by diagram. Our arithmetic a factor affecting our exports. Nations without the decimal system. Branches of the Government calculate decimally. Metric system legal. A glance at the postal convention. Rev. Mr. Kerr's educational report. Scientific labours increased by our tables. Professor Owen's speech to the Board of Trade. A system born of philosophy. Résumé of metric system. Example of calculation necessary by French and English civil engineers, illustrated by diagram. A brain-labour saving machine as valuable as a hand-labour saving machine. Consideration of different views on the subject. Enormous disadvantage at the Exhibition of 1851. In all systems to be advocated three main points always to be borne in mind. Systems proposed for our coinage. System proposed for weights and measures. Advantages of the system. Conclusion.

LORD MACAULAY.

SYLLABUS OF LECTURE BY MR. T. A. CRAGOE, F.R.G.S.

(Read October 28th, 1880.)

A SHORT, comprehensive critique on Macaulay's life and writings. His peculiar genius as an author. Criticism of the essays, especially that on Milton; concluding with the famous Macaulay ballads. "The Battle of Ivry;" recital, with critical remarks. "The Cavalier's March to London," and "The Battle of Naseby," as illustrating the bitter feelings which accompanied the Civil War; recital of these two poems, preceded by critical remarks. "The Lay of Horatius," and how well he kept the bridge; recital, followed by critical remarks. "The Armada;" recital, with critical remarks.

TECHNICAL EDUCATION.

ABSTRACT OF MR. J. C. INGLIS'S LECTURE.

(Read November 4th, 1880.)

By technical education we mean the method of teaching those facts and principles which are directly useful in enabling individuals to perform with skill and precision the arts and operations of everyday life.

Apprenticeship is the well-known term in this country for the recognized method of training workmen in their respective crafts. But within the last few years our insular confidence in the success of the so-called apprenticeships of to-day has received a rude shock. Compare the position of the true apprentice, the learner of a craft when the skilled artisan was the master of his trade, working in his own house, assisted by his own journeymen and apprentices, who were received into his household for the period of their seven years' engagement. In those times the master taught them, ruled them, advised them, clothed them, fed them; in short, had powers over them only second to a parent's; in return for which he was entitled to their services during their engagement. In those days a good master turned out good journeymen.

At the present time a youth, after acquiring infinitely more than his earlier parallel in the way of book facts and book principles, is thrust headlong into workshops, large and small, without the least care being taken in many cases to secure his continuous services for even a twelvemonth, where his immediate exertions must produce so much remuneration to his employer as will justify his presence and his wage. The boy immediately becomes the drudge of indolent men, or a mere machine, performing the meanest of work with neither intelligence nor energy, and commonly has to learn his trade when out of his time.

Technical education is by no means a speciality of the British

workman ; it is indispensable to the proper performance of the duties of everyone.

The phrase as we generally meet with it suggests the teaching of chemistry, mechanics, applied building construction, &c.; in fact the South Kensington syllabus, which no doubt is technical education so far as that teaching appeals to and uses facts and materials for building up its results. The grand distinction between a knowledge of results obtained from books and from the materials themselves, using books as merely guides, must never be lost sight of.

At the outset in a child's career its attention should not be distracted in our Board and other schools with a superabundance of *specific subjects* treated as separate branches of knowledge. The three R's must always stand out the all-important trinity of education in our Board schools, and if specific subjects are introduced, let them have some bearing on the child's future career. For instance, drawing as a science is as much a necessity for the workman as either reading, writing, or arithmetic. It is as logical, and easier understood than either reading or arithmetic, and is of great assistance in the teaching of the latter if properly introduced.

From the official reports there is evidently room for much improvement in our Board schools, but to this improvement the parents as well as the responsible officers must contribute. The grand improvement will be simplicity ; for if good after results are to be expected, higher class skill in teaching must be employed on infants, and their progress—or rather apparent progress—must be slower and more thorough ; their understandings must never be left behind their work. Further on in the higher standards the rudimentary subjects must be more carefully taught. Much can be done incidentally and through reading in gradually unfolding the facts and phenomena of life, without attempting too soon dogmatic generalization.

The manipulative side of the child's faculties ought to receive attention as well as the purely intellectual. To this our present schools give much too small attention, especially as nine-tenths of the children taught there have to acquire—and the sooner acquired the better for them—a rather high standard of this kind of skill. A child from his first to his seventh year becomes acquainted with all the relations of space, time, form, colour, taste, and the various

intellectual ideas arising from combinations of these and manipulative skill—a truly marvellous lesson, which ought to remind us how much has to be acquired and how little can be taught. Much can be done in directing and assisting the manipulative side of the faculties alongside the intellectual.

This to my mind is the great advantage of the Kindergarten system. I would rather hear of a Kindergarten or half-time school being erected in our own town than a truant-school; it is a melancholy consolation, however, to remember that in the latter the elements of a sound technical education not altogether approved of by the pupils will be occasionally communicated to them.

The tendency of the present School Board education is passive, not active—literary, not practical—critical, not constructive. The aptitude for manual work develops itself at an early age, or it is then necessary to nurse it if weak. This aptitude, if systematically cultivated, leads to very wonderful results; but if stifled by a continuous study of literary subjects, such as grammar, languages, and history, to the exclusion of more practical, not to mention technical, pursuits, is by no means easily revived. The literary youth soon acquires literary or clerical ambitions, considers himself too good for a workman, objects to vulgar toil, elects to wear a black coat, and live in dependence for the rest of his life.

A boy has been properly educated when he retains a desire for further education after leaving the leading-strings of his master. No matter how weak the ground on which this desire feeds, if he has only mastered the three R's he will succeed in attaining his object. At present the tendency of our schools is to rush through successive standards, and pass as many examinations and inspections with as much expedition as possible, to the gain of the teacher and the supposed advantage of the pupil; in short, to turn out annually a supply of regulation-taught and certificated children, with a complete education for their sphere in life. Such a tendency encourages the children, on completing their curriculum, to consider themselves educated, which would not be the case if children or youths commenced to learn their crafts sooner, and continued their education longer. Could not the present School Boards make some provision for early and light apprenticeships? In crafts where it has been the custom, and where it is necessary to commence work at an early age, the present arrangement of our education does not suit. During the forenoon, from 9 a.m. to say 12 noon, the classes of

elementary subjects might be taught, and on the boy's parents showing his indenture or engagement in any craft with the view of becoming a craftsman, such engagement being approved by the Board, the lad should be allowed to follow his calling for the remainder of the day. Through the Science and Art Classes, probably not as at present administered, all specific subjects should be taught them in the evening.

One advantage of this would be the influence the School Board would have over the apprenticeships of many crafts at their commencement; for parents would be anxious to get such an apprenticeship exclusion from specific subjects, thus saving time and money. But the greatest advantage of all would be the gradual introduction of the youth from his school-days to his apprenticeship duties.

Education in the larger sense ought to be continuous. Already we have seen the advantage of head and hand work going together; the one training stimulates the faculties for the other. The present system of finishing a boy complete in his mental training, then suddenly turning him into a workshop where he is only required to exercise his manipulative faculties, is wrong in theory as it has been found inconvenient in practice. In France, this experiment of introducing the youth, boy or girl, gradually to the practice of a craft, for a short period at the commencement of the apprenticeship, has been found to be useful.

We have noticed that the old apprenticeship has passed away. Even the old crafts have lost their once definite boundaries, and dozens of novel occupations, each requiring special knowledge, have cropped up. All the assistance technical education has in this country (except in the case of a few large firms who have technical schools attached to their establishments) is given at the wrong end. No provision is made for giving technical education. There is elaborate provision for testing technical knowledge, but none for technical skill, which is far more necessary.

The all-important point in connection with the efficient teaching of technical and scientific subjects is that practice should go hand in hand with precept.

It may not be out of place to enumerate the efforts made in this country for the assistance and advancement of technical education. First we have the Science and Art Classes of the Committee of Council on Education, which give elementary and advanced

instruction in all branches of art, decorative and pictorial, and in twenty-three science subjects.

At works such as Sir William Armstrong's, at Elswick; Sir Joseph Whitworth's; the Great Western Railway Works, at Swindon; the London and North Western Railway Works, at Crewe; and many similar establishments where large bodies of men are employed on high-class mechanical labour, the Science and Art Classes are doing an untold good, and are all that could be desired.

Generally, at places like Elswick and Swindon, mechanical training is taught by men perfectly conversant with the materials represented and dealt with, and the results of these masters' efforts are entirely beyond the ordinary science masters in the same direction, and simply because the former have been technically educated, and can from experience and knowledge draw out the reflective powers of the pupils. I know of no better training for developing the early reflective powers than drawing as a science, and especially now since graphical methods have been invented for performing—or rather arriving at—results only accessible before by the higher mathematical processes.

I am confident, however, that in allowing any teacher who has merely gone through the text-book to take such a subject as building construction up and teach pupils, with no further experience, evil is being done.

The examinations of the City and Guilds of London Institute, for the advancement of technical education, are intended to step beyond the general of the science and art schools, and launch into the particular—the technological of twenty-six callings.

These, with the efforts of the School Boards to teach needlework and cooking, are the only means available for the spread of technical knowledge; but too much attention is given to examination, and too little to instruction, in those technical subjects. Teaching a boy to work at a craft requires as much skill and care as instilling the elementary subjects into his head; and, unlike the latter, one teacher cannot handle with the same facility a large number of pupils. Instruction in handicraft must be individual. At present next to nothing is done; at least, if done, it is done entirely from the good feeling of the men. A youth is pitchforked into our large engine works for five years, two of which are spent in drudgery, from no desire of the employer probably,

but from the inability of the lad to handle the tools, and from the foreman's inattention. In every engineering establishment there are a few "*leading hands*," experienced, trustworthy men, and an apprentice is fortunate if one of these takes to him, or if the foreman puts the lad with him.

It seems to me that it is entirely to the interest of the employer his apprentices should learn to handle tools, and work in a workmanlike manner, at as early an age as possible. That being so, much of the loss of time and opportunity, as well as an additional proper training, would be gained by the employer making a sub-agreement with one of his leading workmen for, say fifteen months, that he communicate to the apprentice to the best of his ability information serviceable to the youth in the learning of his craft, for which the employer will pay the workman an extra fee, so long as he remains with him, in addition to his ordinary wage.

On what does this empire depend if not on our workmen? Professional men are in vain; financial enterprise is powerless; without the ability of our craftsmen to fulfil the obligations of the former. The education of apprentices need not be confined to the well-known crafts, but to all callings involving special skill for their successful practice.

This suggests one very important addition I would wish to see added to the scheme for technological examinations of the City and Guilds of London Institute; viz., an assurance from the master or employer, in the case of an apprentice, not merely that the youth is actually employed, but that he is personally bound to *John Smith*, skilled workman, and has been so for the period of so many months.

Since writing the foregoing remarks I have been informed that such a scheme as here described has been in operation some considerable time at Her Majesty's dockyards.

The privilege of instructing apprentices is a reward or advantage to the best workman, who gets a special allowance for the instruction he communicates to his apprentice or apprentices. A school-master is appointed, and the youths have to attend so many days per week (one or two) for two hours, and learn some subject connected with their craft.

However much we drift away from old institutions, we cannot escape one way or other from this personal instruction in crafts; and if not officially recognized, it is practically, but most inefficiently, acted on.

A closer attention to the special education required for our skilled artizans is necessary. If we wish to keep in the van of mechanical and artistic advancement, we must devise special means for imparting special knowledge; and, above all, text books and examinations, although very good and most useful, cannot in the faintest manner supplant work, experience, and trial in the region of mechanics and art.

I fear we in this country have within the last few years relied too much on our theory of education. "The better the education, the better the workman," is a saying which has been too often quoted. Education is a science, or better, will soon be one, when we reason as to results in the same manner as in other sciences. Obviously, in the bewildering mass of knowledge now before us, the only escape is to ascertain definitely the quantity, and quality, and kind required for the various classes, and aim directly and simply to communicate this as soon, as early as possible. In the case of superior ability, facilities must always be given for acquiring more than the average; but the contention for a less complex, more thorough, grounding for the mass of the people is in no particular against the advancement of the superior mind. "England is no longer the workshop of the world," and no country depends more on its position as a terrestrial workshop. True we are the heirs of a fine constitution, a splendid history, and much that is of advantage to us as a commercial nation; but we are now surrounded by newer, freer, less restricted countries—some new, as America and our colonies; others awakening from lethargy, like Germany and Belgium, which are pressing us hard in the markets of the world.

In England we have now an immense mass of national obligations, cumbrous regulations, and vested interests, so administered, in fact, as to be a heavy tax on the efficiency of our work-producing power, which, after all, is the only true wealth of a nation. It is thus our pressing duty to counteract and reduce as much as possible this friction, and no surer method can be devised than the efficient training of able bodied men in their various crafts.

BRITISH MERCANTILE LEGISLATION.

SYLLABUS OF LECTURE BY MR. R. G. EDMONDS.

(Read November 11th, 1880.)

INTRODUCTION. Magnitude of the interests concerned. Legislation as regards the ship, captain and officers, owners and seamen: their several duties and responsibilities. Deck cargoes. Advance notes: their speedy abolition. The Plimsaul agitation: its causes and beneficial results. Suggestions for future legislation.

PLYMOUTH: ITS PROGRESS AND PROSPECTS.

SYLLABUS OF LECTURE BY MR. W. H. K. WRIGHT.

(Read November 18th, 1880.)

INTRODUCTION. Plymouth of the past. Brief sketch of the rise and early state of the town. Plymouth "a mene place." Plymouth at various periods in its history. The days of Elizabeth. The state of the town during the siege. Plymouth at the close of the Elizabethan century. "Plymouth in an uproar." The early years of the nineteenth century. The subsequent rapid progress of the town and the causes thereof. Plymouth in 1880. Rateable area. Population. Increase of the number of burgesses. The public buildings and institutions of the town. Present aspect from various points of view. Comparisons. Plymouth of the future. What it may become, and ought to be. Its natural advantages and disadvantages. A glance at the numerous social questions affecting the welfare of the people, and the progress of the town. Further developments contemplated and desirable. The duty of all good citizens. Conclusion.

MODERN LITERARY STYLE.

SYLLABUS OF LECTURE BY THE REV. BENWELL BIRD.

(Read November 25th, 1880.)

THE place of literary style among the arts, and the principles it has in common with them. Ever-accumulating materials for English literary art. The growth of the language. The effects of the study of philology upon style, for good and evil. The study of Anglo-Saxon. True and false purity. Illustrations. What is plain English? Misleading answers. Modern Johnsonese. Extravagant writing. Indiscriminate use of superlatives. Examples from art. Criticism. Imitators of Ruskin. Remarks on best models of style. Vicious style of writers eminent on other grounds. Illustrations. Some characteristics of modern periodical literature—magazines, reviews. Hasty and careless writing. Newspapers—Metropolitan, Provincial, American.

BLEACHING AGENTS.

SYLLABUS OF LECTURE BY MR. A. RIDER, F.C.S.

(Read December 2nd, 1880.)

ORGANIC and mineral colouring matters. Colours of artificial origin. Action of atmospheric oxygen. Hydroxyl. Sulphur dioxide. Chlorine. Chloride of lime. Bleaching by these bodies. Theories. Illustrations.

THE GREAT MAP OF PALESTINE.

SYLLABUS OF LECTURE BY MR. J. SHELLY.

(Read December 9th, 1880.)

THE establishment of the Palestine Exploration Fund. Its first objects. Explorations in Jerusalem. The proposal of a Survey. The value of an accurate map. The defects and errors of existing maps. The beginning of the work. The nature of the country. The method of the work ; its progress, difficulties, and dangers. The murderous attack on the party at Safed in 1875, and stoppage of the Survey. Its resumption, and the completion of the work. Results of the work. Present condition of Palestine. What has yet to be done. The lecture was illustrated by a copy of the great map of Western Palestine, mounted for exhibition, kindly lent by the Fund, and by former maps and diagrams.

PYTHAGORAS.

SYLLABUS OF LECTURE BY PROFESSOR CHAPMAN, M.A.

(Read December 16th, 1880.)

THE relation of the subject to modern life. Sources of information and their value. The outlines of his career. His visits to Egypt, Babylon, and Lacedaemon, and settlement at Crotona. His great personal influence, and formation of a brotherhood. Contributions to mathematical and astronomical science. The drift of the Pythagorean speculative philosophy. The meaning to be attached to the fundamental doctrine that "number is the principle of all things." How far this harmonises with some modern speculations. The nature of the Pythagorean brotherhood. Its excellencies and defects, and the general truths it embodied. A general estimate of the efforts of Pythagoras in relation to knowledge and conduct.

THE HYGIENE OF OCCUPATION.

SYLLABUS OF LECTURE BY MR. G. JACKSON, F.R.C.S.

(Read December 23rd, 1880.)

INTRODUCTION. The necessity of having an occupation. First, that of school life. Second, of the agricultural class. Third, miners. Fourth, artizans, with reference to some special occupations, such as workers in hair, wool, and rags. Fifth, employés in shops, clerks, &c. Sixth, soldiers and sailors. Seventh, literary and professional men. Eighth, the mercantile class, including tradesmen of different descriptions.

OVERCROWDING: HOW IT CAN BEST BE DEALT WITH IN PLYMOUTH.

SYLLABUS OF LECTURE BY MR. ODGERS.

(Read January 20th, 1881.)

INTRODUCTION. Overcrowding—Oxygen starvation, foul air, want of light and bad drainage, as factors in the production of disease; some examples of overcrowding in Plymouth; sickness amongst the poor, and the loss it occasions; overcrowding and immorality; the "Poor Man's Drawing-room;" evils of pulling down without building up. Remedies—Improving old houses; improving overcrowded areas; new buildings, what should they be like? some London plans; arrangement and construction of improved dwellings; regulations for their proper use.

SAMUEL COOK, ARTIST.

BY MR. W. EASTLAKE.

(Read January 27th, 1881.)

BEFORE reading my paper, I desire to say that I have prepared it at the express wish of several members of this Institution. In doing so I have felt, on the one hand, that perhaps no one living could give more information concerning the life and works of Samuel Cook than myself, having had exceptional advantages and opportunities of obtaining such information. On the other hand, I have been very conscious that all available materials relating to so very uneventful a life as Cook's would barely make up a lecture that would interest a general audience. I have therefore been compelled to introduce many matters that may be deemed trivial, though even these will be found to connect themselves, either directly or indirectly, with my subject.

Samuel Cook was born at Camelford, in Cornwall, in the year 1806. He was the child of a poor woman whose mother kept a bakehouse in that town. Whilst very young he went to a little school kept by a Mr. Caleb Hender, where he learnt to read and write; and he never received any other schooling. Even at this early age the passion for drawing had possession of him, for he used to draw with a bit of slate on the slate-stone steps of the school door (birds in profile, and other simple subjects); and it is recorded that at the age of six or seven he bought or begged at the druggist's bits of indigo, rose-pink, gamboge, and yellow ochre, and tried to paint with them.

At the age of eight or nine he was bound apprentice by the parish to Messrs. Pearse, woollen manufacturers, at Camelford. Part of his duty at the factory was to feed a machine called a "scribbler" with wool, and in the intervals of this labour the boy was frequently observed to be drawing with a piece of chalk on

the floor of the factory, thereby getting into sad disgrace with Mr. Richards, the foreman, and causing his master, Mr. Pearse, to prophesy with some vexation, "That boy will never be fit for anything but a limner." Little did the master or the foreman think *what* a limner the boy would one day become.

During his apprenticeship he lived at home with his mother and grandmother, and amongst his fellows he went by the name of "The Limner Cook."

About this time he made a sketch of his grandmother, a very old woman, sitting in the chimney corner beside her bakehouse oven. He also drew at this early age miniature portraits in water-colour in profile.

As an apprentice boy he was occasionally sent to Bodmin on errands. Bodmin at that time must have been a miserable country town, but nevertheless a metropolis compared to Camelford; and it contained a small print shop, before the window of which the youthful artist used to stand spellbound. This very humble initiation was clearly the first he ever had in pictorial art, and it was probably some print he saw in this window which first inspired him with an earnest desire to paint a miniature on ivory. It is unnecessary to say that ivory was then, to him, utterly unattainable, so for want of a better substitute the persevering and determined boy actually painted a miniature on his left thumb-nail, copying the head from a print, and colouring it from his own fancy. Not long after this an uncle of his, who kept a billiard-table at Devonport, hearing of his desire for ivory, sent him an old billiard-ball, which the boy contrived to cut in two, and then painted a miniature on either half.

It is hard to conceive the full extent of the difficulties which beset this part of his career, or to estimate sufficiently the strength of will, the patience, and faith which animated that gentle nature to struggle against them. We must remember that he had hitherto not only *no* art instruction, few materials, and but little leisure, but, what is worse, he could have no sympathy, certainly no *intelligent* sympathy; and most likely, on the other hand, discouragement, ridicule, and even blame, hard for such a refined and sensitive mind to bear. The faith, however, which was so strong within himself at last began to influence others.

He was applied to from time to time to paint signs for public-houses, comprising bunches of grapes and the like. These com-

missions he at first executed out of working hours; but by degrees his master consented to his devoting more time to painting, seeing plainly, as he said, "the boy would never be fit for anything else." A more lucrative employment he found in graining wood, and the excellence of his work at this period was the more remarkable as he could have seen but very few specimens of the grainer's art.

At the age of twenty-one, having completed his apprenticeship, he left Camelford, and started to walk to Plymouth. I remember his telling me that he carried his best boots in order to save them, and walked in a very dilapidated old pair, which he discarded on entering Torpoint. On his way he took two portraits at roadside public-houses, which paid his expenses; for he received a sovereign for each of them.

I should much like to have met young Samuel Cook when he first reached Plymouth; but it was before my time, or rather, I was a very young child, and knew nothing of him till some years had elapsed.

At Plymouth Cook apprenticed himself to, and then became an assistant of, a Mr. Winsford, a painter and glazier, in Frankfort Street, and received the humble salary of eight shillings a week.

About thirty or forty years ago the art of *graining* in imitation of oak and maple was much in vogue, and Cook's artistic talent enabled him to execute this class of work in a manner far superior to anything that had been done before. He got samples of real oak and bird's-eye maple, and copied them with the eye and the hand of an artist, and instead of graining in the common and most mechanical way that had been customary he positively imitated the different woods in an artistic manner, so that his graining, instead of being the conventional and stereotype pattern was, in fact, an actual deception. He painted a deal chest of drawers mahogany, and actually deceived the cabinet-maker who had made them. His imitation of marble was even more deceptive. Thus Cook became painter, glazier, and decorator. He was also a frame-maker, and to the last he made frames for his own works, as well as for local artists and the public generally.

At this time he still painted signs for inns, but of a better description, as well as scenes for a small theatre named the Pantheon, in Vauxhall Street. Amongst other scenery there he

painted the scenes for a play called "Obi; or, Three-fingered Jack;" also for a piece called "Indiana," and for another called "The Vampire." This was in 1835.

Cook was frequently employed by owners of peep-shows to paint scenes for them. Peep-shows are, I believe, gone out of fashion; but most of us remember the peep-shows that frequented the Plymouth November fairs, for some of which Cook painted scenes. While on the subject of peep-shows, I may add an anecdote connected with Samuel Cook. He was staying with his friend William Hicks, of Bodmin, at a time when a peep-show in that town had been accidentally destroyed by fire. William Hicks, then keeper of the asylum at Bodmin, was solicited for a subscription; and Samuel Cook, who had become an artist of repute, put his hand in his pocket, and gave the poor woman whose peep-show had been burnt a sovereign. Then turning to Mrs. Hicks, who was present, he said, "I remember when I painted scenes for peep-shows for a living."

At the age of twenty-six Cook married the excellent and worthy wife who still lives amongst us. Two sons were the result of that marriage. The eldest died in 1866; the younger one is a well-known artist resident in this town. It was only a short time before his marriage that Samuel Cook had set up himself in business as a painter and glazier, and he was by this time becoming known as a clever decorative painter, Mr. George Wightwick, the architect, being one of his earliest friends and patrons.

All his leisure was devoted to out-door sketching from Nature, and his especial haunts for this purpose were about the quays and by the sea-side. Indeed, he seemed thus early to have been imbued with an artistic love of the sea and its belongings; and it was this artistic love of the sea that led him on to be one of the most poetic sea-coast artists of his day.

His sketches at this period of his career were distinguished by delicacy and timidity of colour. The truth was in them, but it was understated. He felt his way to colour by degrees, and it is invariably found that the greatest artists began in the same manner. Cox, De Wint, Varley, Prout, and Turner, all began by a timid method of colouring, as if afraid of it, and gradually increased their strength and power and brilliancy of colour as they gained experience. I have seen many of Cook's sketches in his early career, and have found them always low in tone, grey and quiet in

colour. He was then learning to know Nature thoroughly, and with that knowledge came strength.

Amongst those who first detected his capabilities as an artist were Colonel Hamilton Smith, and his earlier friend, George Wightwick, and Mr. William Jacobson, a distinguished amateur artist—all three of them then residents of Plymouth.

Colonel Smith, as we all know, was a great authority as an antiquary and a naturalist, and he was also an artist. He could paint a battle-field in the time of William the Conqueror with a more thorough knowledge of costume and armour of the period than perhaps any one then living; and when a whale was brought into the port of Plymouth his opinion was sought as an authority concerning its species. His friends regarded him as a living encyclopædia on all such subjects, and both Macready and Charles Kean in their revivals of the plays of Shakspeare gladly availed themselves of his knowledge both as to scenery and costume.

George Wightwick, the well-known architect and Shaksperian reader, has left a name and reputation behind him in this town that will be long and affectionately remembered.

William Jacobson was for many years a solicitor in this town, a patron of art, and a true friend to artists.

Portraits of each—Colonel Smith, Mr. George Wightwick, and Mr. Jacobson—hang in this hall.

It was fortunate for Samuel Cook that he had the acquaintance of such men in his early career. Colonel Smith not only lent him anatomical prints, by which Cook obtained a very fair knowledge of the human figure, but Cook after working hours spent his evenings in the Colonel's company. His intercourse with Colonel Smith, and the advantages derived from such intercourse, cannot be too highly estimated. It was customary for him to stay at Colonel Smith's house in Park Street till midnight, and he did this regularly for six years.

George Wightwick, on the other hand, was able to put a considerable quantity of decorative work into Cook's hands. It was through his introduction that Cook painted, grained, and decorated the house of Sir John Buller, afterwards Lord Churston, at Lupton, in the staircase of which he painted on the walls the views that were immediately outside the house. He also decorated the residence of Sir William Molesworth, at Pencarrow, and the house of Mr. Phillpotts, at Porthgidden, amongst many other country houses

in the two counties. And it was through George Wightwick that Cook became known to, and appreciated by, the late Countess of Morley, who was herself a distinguished amateur artist.

As one introduction leads to another, so Lady Morley brought Cook to the notice of the Duke of Devonshire, who was so pleased with what he saw of the artist and his works that he commissioned him to make drawings at Lismore Castle, in Ireland, where Cook went in February, 1850, and was made much at home for about four weeks, the Duke showing him marked attention and kindness both on that and after occasions.

[The lecturer showed a sketch of Cook's, sent to his wife whilst he was at Lismore, and read a letter from Mr. Wightwick to Cook whilst the latter was there.]

I well remember his bringing these Irish sketches and drawings home with him to finish. They were mostly inland and wooded subjects, painted with exquisite feeling and refinement, but far inferior in artistic quality to what he was about to do with sea-coast subjects.

The Plymouth Theatre was at this time in the hands of Mr. Hay, the manager and lessee, and required to be decorated. Col. Smith gave Cook many hints, and Cook prepared sketches for the purpose.

Cook likewise painted for Mr. Hay the scenery for the spectacle of "Aladdin," and also undertook and executed for him a panorama of the war in Afghanistan. This panorama was exhibited in Plymouth and in the chief towns of Cornwall, and in this gigantic work Cook showed in a marked way what stuff he had in him. Colonel Smith supplied him with sketches for costume, &c. The panorama was a great success. Hay travelled with it, and described it himself, and had appropriate music played during the exhibition. What Cook got paid for this enormous work, or what has become of it, I have not been able to trace.

Mr. Hay subsequently gave Cook a benefit at the Plymouth Theatre, when "As You Like It" was enacted. The house was filled, and Cook was well satisfied with his receipts.

It was about this period of his life that I became well known to Samuel Cook; and being myself an amateur dabbler in art, was only too well pleased to have made such an acquaintance. I became a frequent visitor at his humble home in Westwell Street, in a house which no longer exists, but which stood just opposite the entrance to St. Andrew's Hall. It was here that Cook painted his

first original and poetic water-colour drawing, which he called "The Sailor's Grave." It was a large drawing, and represented a storm on a coast, with a single figure of a drowned sailor lashed to a mast. It was a sad and gloomy picture—cold and grey in tone, but most poetic in its feeling. This drawing at once marked him as a great coming artist. It was exhibited at the shop of Mr. Stone, a tailor, opposite the Branch Bank of England, and was bought by his friend, George Wightwick, who, some years afterwards, in a short memoir of Cook, wrote of it as follows :

"The excellence of the execution, considered as that of one wholly untaught by educational process, or by any extended acquaintance with pictorial example, is marvellous, and the conception is even more extraordinary. The spectator is in the position of Ariel, safe in the midst of ocean fury. The picture is composed of a cloud, a rock, the valley of two giant waves, with a gull in the hollow, the small fragment of a wreck, and the corpse of a sailor. A body of water has just impinged upon the rock, and burst, as it were, into a white powder, which gives the light of the picture, while a piece of dark mast springs up in the midst. Never was there a finer instance of artist-magic than in this perpetuation of an awful instant. The picture is little else than a piece of mottled grey, with tints varying from white to dark green ; but every thing, from the glassy smoothness of the wave-valley to the wind-swept edges of the wave summits, is presented with a truth showing how the grandeurs of Nature require no idealization."

I have dwelt on this particular work of Cook's because it was certainly the first that evinced at once the fulness of the artist's genius.

I cannot fix dates to all the incidents mentioned, but it could hardly have been far from the date of this drawing that Cook assisted in getting up some *tableaux vivants* at the Mechanics' Institute, under the guidance of Col. H. Smith. The frame for these *tableaux* was painted by Cook to imitate a gold frame, and was, of course, on a large scale. Though present at the preparation and at the evening exhibition of these *tableaux*, the only one that I recollect was called "The Rising Sun," in which a short old man was stretching his hand up to a very tall, thin, young one, supposed to be his son. The young man was Samuel Cook. Cook was much above the usual height, very slight, and delicate-looking ; his face long and thin, and his hands also ; narrow-chested, and apparently one likely to suffer in the lungs. His portrait, by our fellow-townsmen, Mr. Edward Opie, is an admirable likeness of what Cook was when it was painted, in the year

1856. This fine portrait is the property of Mr. Cook's family. I have no right to anticipate its future and final abode ; but may, perhaps, be permitted to hold out some prospects of its being one day presented to this Institution. The portrait of Cook in chalk is by the late Field Talfourd, and belongs to me.

Another important drawing made by Cook at about this period was that of a gipsy encampment. As well as I remember the figures must have been ten or twelve inches in height ; it consisted of a large group ; each figure had been thoroughly studied, and drawn from a model in the attitude represented. Cook had made several studies purposely for this drawing, which became the property of Colonel Pedler, at Mutley House, where I frequently saw it. I am not aware in whose possession it now is. It exhibited remarkable knowledge of the human figure, which he must have rapidly acquired under the instruction of Col. Hamilton Smith, and from drawing from life. He was in the habit of getting seafaring men and others to stand for him as models in all sorts of positions and attitudes.

It is scarcely to be credited, and yet it is the fact, that at this time, when he was painting water-colour drawings that would have been a credit to any exhibition, he was still house-painting and graining wood, and I have seen him on his knees engaged in this comparatively mechanical work in a closet, when he might have been devoting his time to the art which was about to make him great.

His time was now becoming valuable and was well filled up, but he managed to get up to town and have a look round at the spring exhibitions, when he felt himself for the first time weighed in the balance with others, and knew that he was not found wanting.

It was about the year 1850 when he made drawings for admission to what was then called The New Water Colour Society, but which now bears the name of the Institute of Water Colour Painters, in London. The Society at once showed their discrimination by unanimously electing him, and from that moment he attained a status in the art world.

Having arrived at the period when Cook was fairly before the public as an exhibitor, it is time that I should describe and criticise his works.

The character of an artist as a man may generally be learnt from his works, and this was never more strikingly exemplified than in

the instance of Samuel Cook. Of all artists, none, perhaps, ever more realized in his personal appearance, manners, and character, what the expression of his pictures led the observer to expect.

All the marks of superior mental and moral denotement shown in the paintings of Samuel Cook, were equally apparent in the presence of Samuel Cook himself—worthy of being Nature's lover in that he was one of her own true gentlemen.

I do not consider his drawings were ever seen to advantage in the Water Colour Gallery. They were so delicate in colour, and so wanting in all that false glare which is improvised by many artists, only for the exhibition room, that they frequently failed to attract the eye of either a purchaser or a critic, and they occasionally returned to the humble studio from which they had emanated. But Cook was one of the few prophets who have had honour in their own country, and his drawings (certainly most of his best works) were purchased in this locality.

Cook never consented to "paint up for the exhibition." To fully appreciate his works they should be seen apart from the glare of the exhibition room. His first aim appeared to be to insure a sufficient and proper *atmospheric* effect. It was this insistence that stamped his drawings as works of a high order. Many an inferior artist is satisfied to copy what he *sees* in Nature as literally as his ability to do so admits; but the air which more or less affects all Nature is too often lost sight of. Another exceptional quality in Cook's works was the entire absence of any manipulative dexterity. No witchery of the hand could ever be detected in them. The *mind* was there, and plenty of it, but the *hand* was an indefinable mystery. His colour, as I have said, was delicate almost to timidity; but he certainly saw and painted more of the greys of Nature than most artists.

I ventured to ask him once if he could not paint stronger pictures. He replied, "I am afraid if I did I should lose delicacy and refinement." Doubtless, had he been a more powerful colourist, his works would have been far more attractive, but his subdued refinement of colour was typical of his physique; he could no more have been a showy colourist than he could have been a ploughman. Thoroughly understanding the details of realistic Nature, which he never failed to study and admire, his drawings were nevertheless always more or less poems. He did not fail to *see* Nature in prose, but when he represented her, his translation was

poetic. Whether in the glowing quiet sunset, or the grey stormy morning, whether in repose or action, the same high aim for idealistic effect was ever prominent. His skies were all studies from Nature, and so justly did he estimate their importance, that he was often weeks in deciding on the sky suitable to a particular sketch. He kept a long-shaped book of skies, many of which he painted from his studio window. These sky studies form pictures of themselves, and I am glad to say that some of them at least have found their way into the studios of our local artists.

In his earlier career he did not confine himself to any particular class of subject, but he soon discovered that his fullest strength lay in sea-painting, and in sea-coast subjects, in which it is not too much to say he has never been surpassed. His wave drawing in rough seas would certainly challenge comparison with any artist living or dead, and those who have been most renowned in this particular branch of art (amongst whom I may mention the name of Clarkson Stanfield, R.A., and Mr. Duncan) have paid the warmest tribute to his excellence. It must be remembered that although a rolling wave can be seen, its rapid movement precludes its form being drawn with accuracy. An *impression* of the form is made on the eye, and can only be conveyed to paper by the feeling of the artist. Cook *felt* his rough seas and wave forms, and expressed their characteristics through such feeling.

Considering how incomplete was any education he gave himself (and he certainly had no other) of figure drawing, it is remarkable how he attained the amount of knowledge he did of the human figure. He had never gone through a course of drawing from the cast, and then entered a Life School, as all young artists now do, but he had, nevertheless, given some study to anatomy, and had copied some good engravings of figure subjects, lent him by Col. H. Smith. His figures were always judiciously introduced and placed, and well drawn.

Many may have passed Cook's drawings in the London Gallery with scarcely a notice. There was nothing in them to *arrest* the attention of an ordinary observer; but once stop before them, and look well at their careful finish—finish without pre-Raphaelitism; at their breadth—breadth without blot; at their mystery without confusion; and then compare them with most works of contemporary artists, and their full value may be estimated. Time and practice may give an artist a *hand* enviable for its facility; but no

time, or practice, or aught else, can give him (unless he has it in him) a poet's eye, and a poet's soul. Such were Nature's gifts to Samuel Cook.

Merits such as these could not long remain unrecognized, and very soon judicious critics began to appreciate his truth and refinement, and the high poetic feeling evinced in his works.

It was with real pleasure that I called the attention of two eminent art critics to his works. I had known for years the late Mr. Tom Taylor, art critic for the *Times*, and Mr. Ruskin. Mr. Taylor was always ready to notice works of art from the West of England to which I called his notice. In the *Times* of 27th April, 1860, Mr. Taylor wrote as follows, when reviewing the Water Colour Gallery : "Of all the drawings in the room none have left so pleasing or so lasting an impression upon our minds as three of Mr. S. Cook's ; one, a view from the grounds of Clovelly Court—a simple subject, nothing more than a foreground of grey pebbled beach, dove-coloured in the lights, and purple in the shadows, with the green sea breaking on the far off tide-line, and Lundy Island looming through the morning haze on the horizon ; and a companion pair, one representing the same coast scene as seen at early morning, with the fog just lifting, and the seamews splashing in the shadows, the other, the close of day, with the tired beachmen wending their way homewards, and the red sunlight low in the west. All Mr. Cook's work indicates in the artist genuine refinement, as well as that sincere and unpretending love of Nature which never fails to bring its reward in results that appeal to the heart as well as the eye."

Mr. Ruskin mentioned Samuel Cook's drawings in his yearly notices of pictures. In 1857 he said of one of his drawings of "Trebarwith Sands," "Mr. Cook has a very fine eye for colour, and great understanding of sea. I like all his drawings exceedingly. This seems on the whole the leading one ; the rosy sunlight opposing the strength of the green waves very beautifully."

Independently of his published criticisms, Mr. Ruskin wrote to me concerning Cook and his drawings, and often talked of him and them when we have met at the London galleries. But Cook was really too great to be affected by praise, though his nature could never be indifferent to sympathy. The best of husbands and of fathers, a kind and faithful friend, he was always the first to rejoice in the success, and to point out and enjoy the merits, of a brother-

artist. On one occasion the criticism of a London paper having exalted him, as he thought unduly, to the disparagement of a brother-artist in a comparison of their respective works, Cook felt so much distressed that he wrote to him expressing regret at the paragraph, and repudiating the pre-eminence. His simple and sincere humility was indeed one of his greatest charms.

Two features in Cook's uneventful life deserve especial notice. One refers to his annual out-door studies from Nature, generally in company with other artists and amateurs; and the other to his important position in the Society of Artists and Amateurs which existed in Plymouth some years since. I will refer to both these in the order they have been mentioned. Having been in the habit through all his previous art-career to study directly from Nature, it was in the year 1850 that he went for the first and only time abroad. He then accompanied one of his earliest and best friends, the late Mr. William Hicks, of Bodmin, who, with Mrs. Hicks and Mr. Oliver, a relative, took a tour in Switzerland. They went first to Brussels, visiting Waterloo, then to Antwerp, Cologne, Bonn, up the Rhine to Mayence, Basle, Berne, and Interlachen, where they made some stay. At Interlachen Cook made some useful sketches. They then went to Meiringen over the Brunig Pass, thence to Lucerne, where on the lake he made a sketch of Mount Pilatus in colour, and home by Ostend. This trip occupied a month, but being with tourists, not artists or amateurs, Cook's sketches were all slight and small. Still, he had seen the vastness of Swiss mountains, and had grasped with the eye and hand of genius some of the difficulties of space and size in transferring them to paper. I remember them well, and have never seen before or since such immensity expressed in so small a compass and in such light work. He made finished drawings from some of these Swiss sketches, the best and most important being a view from the Wengern Alp—the exact spot from which he made his sketch was at once recognized by myself when there some years afterwards. This drawing is in the possession of Mr. Whiteford, at Thornhill.

In the autumn of 1851 a more studious and more earnest sketching tour was organized by myself. We consisted of Cook, Mr. Mitchell, Mr. Bell, and the late Mr. Talfourd, and we were subsequently joined by Mr. (now Sir Robert) Collier. We were all five bedded and boarded at the little road-side inn called "The Saracen's Head," at Two Bridges, about a mile and a half from Princetown,

Dartmoor. Each of us in comparative youth, with health and spirits enhanced by the bracing air of the Moor; all of us bent on spending the longest possible day in out-door sketching; it will not be difficult to imagine that we were a very merry party. Beginning the day early, most of us took a dip in the river, not our friend Cook, who amused himself by watching us from the bridge. After a substantial breakfast we started for the day, taking a crust for our luncheon. We either went to Dartmeet or Postbridge, each about four miles distant, or we might have been found nearer home, in the Beardown Valley, or at Wistman's Wood, or possibly on the top of Longaford Tor. In each of these localities sketches were made by all of us. But what were all the rest compared to Cook's! He gave the poetry, most of us only the prose. We all looked up to him and to his sketches with admiration and wonder.

For a weakly frame and constitution, Cook at this time enjoyed his life, joined in the chorus after dinner of many a comic song, laughed at and enjoyed a joke (and there were many in those days) as much as anyone. After dinner in the fine, long, and warm summer evenings we generally took a stroll out together before bedtime. On one occasion, smoking our cigars (Cook was fond of tobacco, as most artists are), we strolled into the smithy close by the little inn. The men were at work, and the firelight fell picturesquely on their figures. Cook screwed up his eyes, as was customary with him when looking at a subject for a picture, and presently afterwards, on returning to the inn, we all tried our hands at representing the interior of the smithy. Cook's sketch on that occasion, entirely from memory, which I have much pleasure in exhibiting, is in my possession.

From Two Bridges we all proceeded to Chagford, over the moorland road, and took up our quarters at the "Three Crowns." Here again sketching from Nature from early morning till dusk was our sole occupation. The celebrated Holy Street Mill, which has been so often painted, afforded Cook a favourite subject, and he sketched it in oil, and made some other sketches with the same vehicle. These were the only occasions in which I have known him paint from Nature in oil colours. He made also some valuable sketches in water colour during this visit to Chagford, by the river side and at Whiddon Park. There was some sketching made even after dinner by lamplight. Talfourd made a most excellent likeness of old Mrs. Brock, the then landlady: Bell and I made sketches of

the kitchen, which was then very picturesque ; and on one evening Sir Robert Collier sketched my own portrait, whilst Cook sketched both Sir Robert and myself. Both these sketches are in my possession. Some humorous verses were written in the visitors' book by Sir R. Collier, and are in the book now to be seen at Chagford.

Our visit to Chagford brought that most pleasant sketching tour to an end, and we returned home with folios well filled, Cook and Mr. Mitchell making subsequently some important drawings from their sketches.

Sir R. Collier was one of those who fully appreciated Cook. Sir Robert, as is well known, has since taken the very highest position as an amateur artist ; his grand Swiss pictures find places (as they deserve to) on the line at the Royal Academy, and he is recognized as the head and chief of Amateur Pictorial Art in this country. The fine picture by him of the Austrian Tyrol, hung in this hall, will favourably compare with the work of most professionals.

I cannot trace the exact dates of our subsequent sketching tours, but we made an excursion annually ; and probably it must have been in the following year that Cook, with the late William Bennett, a Member of the Institute of Water Colour Painters, Field Talfourd, and myself, formed a party to sketch in Windsor Forest, where Bennett, who was a most distinguished artist, had made some of his best drawings. Bennett had given me lessons in London, and it was through my acquaintance with him that the little party was formed. Cook had great admiration for Bennett's works, and was delighted to be one of the party, whilst Talfourd congratulated me and himself on the rare chance we two had of going sketching with two of the first men of the day. We took up our quarters at a little public-house quite in the heart of the forest, called "The Crispin," where we were made very comfortable in the humblest possible way. "The Crispin" was frequented mainly by the royal keepers, who we found very useful to us in giving us access to the private drives and other quiet nooks of the forest. In these we sat all day long, sketching the grand old oaks and luxuriant ferns, abundance of game of all sorts running about us, but not a human being to be seen. The freedom from intrusion was most enjoyable. Bennett had attained a celebrity for his delineations of oaks, and ferns, and forest scenery ; and Cook, who had had little experience of such subjects,

carefully looked at and admired his sketches, and imperceptibly was led to sketch very much after Bennett's manner. One fine sketch in particular (now in the possession of Mr. Mortimer Collier, at Horrabridge) which Cook made on this occasion might almost be mistaken for a Bennett. Cook knew his strength, and his weakness; in sea-coast subjects no one could beat him, whilst in luxuriant foliage and rough herbage he saw he could learn from another. Bennett, on the other hand, who was in the habit of visiting Hastings annually, and sketching there, told me he should never think of exhibiting a sea-coast subject again, after he had once seen what Cook was able to do; and this was when Bennett received £300 for a single drawing of rough sea. Some years after, when Bennett was on a visit to me at Plymouth, the year after Cook's death, I took him to see a small coast drawing by Cook, at the house of Cook's widow. Bennett was so delighted with it that he desired me to tell Mrs. Cook he could give or get for it (I forget which) £100. This was a drawing Cook had made recently before his last illness, and for which he was to have received £10!

This trip to Windsor Forest did Cook great good as a landscape painter. He had not previously seen any first-class artist at work, and it gave him new ideas for future pictures. Moreover, it is very certain that the time and attention he had given to studies of the sea and coast had precluded him, up to this period, from sufficient study of *foliage*, a study which as an amateur I may venture to say is *sui generis*. It is a well-known anecdote of a conceited and ignorant pupil that, coming to an artist for lessons, he stated that he could do everything but trees. Trees have puzzled some of the greatest artists, and perhaps it was not until Harding, that prince of drawing-masters, published a series of works showing how trees and foliage might be expressed by a method and system peculiarly his own, that such subjects were properly understood.

Subsequent to this visit to Windsor Forest Cook made some remarkably fine drawings, in which the anatomy of trees, and the effect of wind on foliage, were prominent features; and these drawings contained a quality which even Bennett would have envied, for they were invariably impressed with a *poetic* feeling. I have in my mind especially a grand landscape, quite the most important in size, nearly four feet long, and the most artistic landscape Cook ever painted, representing the Dolwyddelan Valley

in Wales, the property of Mr. Mark Grigg, at Tamerton; also a fine drawing of Ivybridge, taken from the bed of the river, the property of Mr. Prance, of Hampstead; and a drawing of the East Lyn, taken from the grounds of the late Sir William Herries, the banker, the property of Mr. Liscombe, of Mannamead.

Another of the sketching tours deserving of mention was the year we went together to Lynton and Lynmouth. The party consisted of Cook, Mr. Mitchell, Mr. Talfourd, Mr. Bell, and myself. We first took up our abode at the lower town; but soon found it best to be nearer our subjects on the road to the Water's Meet. Here Cook made a series of fine sketches, sometimes sitting in the bed of the river, either looking up or down the Lyn, and occasionally on higher ground, with the Countesbury Crag in the distance, and now and then in the picturesque grounds of Sir William Herries. Our party was joined by the late David McKewan, a member of the Institute, and by another artist of the name of Dearle. Such a strong party in so small a place soon became known, and we accepted the invitation of Sir William Herries, and spent a most delightful evening at his charming house on the East Lyn, where we were much gratified by the inspection of some folios of rare drawings by many of the leading artists.

We left this hospitable house rather late, and in the highest spirits. It was perfectly dark, and knowing nothing of our way out of the grounds, we borrowed a lanthorn, which one of us professed to carry as a guide to the rest; but in the rollicking spirit of fun and practical joking which pervaded the party generally, the custodian of the lanthorn, whose name I prefer not to mention, leapt over the flower-beds, ran in dangerous proximity towards the brawling Lyn, and otherwise conducted himself so much like a will-o'-the-wisp, that poor Cook with his long legs was soon sprawling amongst the rose-bushes, and he and the whole party, convulsed with laughter, awoke the stillness of that dark summer's night in a way not easily forgotten. This frolic is mentioned to show that with all dear old Cook's refinement and poetic nature he dearly loved fun. He roared over his escapade like a schoolboy, as indeed we all did.

But this frolic was soon to be followed by what might have been a very serious affair for some of us, and for Mr. Mitchell especially. We were contemplating a sketch from the main road to the Water's Meet through the wood. We had all been looking at the subject;

but eventually only Mr. Mitchell sat down to it, the rest of us (and I was the last to leave him) taking up our positions a little further on, or lower down in the river. Mr. Mitchell had not been sketching long before he noticed some earth and stones falling from the high bank at his side. This fortunately annoyed him sufficiently to induce him to move his seat about three or four yards from the spot, where he again proceeded with his sketch. In about ten minutes from this time a huge landslip came down with terrific weight and force on to and over the exact spot where Mr. Mitchell had been sitting, the ponderous *débris* consisting of enormous stones flying into the air, rebounding from the roadway, and carrying everything before it, rolling into the Lyn. This landslip of probably several hundred tons in weight completely blocked up the roadway, and some carriages that had passed just previously were unable to return that way, the blocks of stone being irremovable until they had been blasted and split up. Mr. Mitchell hastily arose from his sketching stool in horror, and saw this avalanche fall and shake the ground under him, being just sufficiently distant from it to save himself from annihilation.

Our consternation, on returning to the roadway on our way home, and discovering what had happened, may be imagined. Mr. Mitchell did not readily recover from the fright, and we had to do our best to rally him. I ventured to depict the occurrence in a small sketch, and sent it with a description to the *Illustrated London News*, where it appeared the following week.

During this excursion I remember sitting with Cook in the bed of the river when he was sketching the view, with the river running *from* him. It is a well known fact that artists rarely paint water running *from* them. It is difficult to give expression to the flow of such water, and it is consequently generally avoided. Cook represented the water as running towards him, and therefore had to originate that portion of his sketch; but no one knew better than Cook how to give the truest idea of running water.

Cook subsequently made a large drawing of a land storm near the Countesbury Crag, now in the possession of Mr. Mark Grigg, at Tamerton. We all saw this storm under the effect of lightning and thunder, with the trees bent and torn by the blast, and, storing up the impression made on his mind, he reproduced it in this fine drawing with singular success.

Sir John Karslake, Mr. Montague Bere, and Mr. Lopes were all at

Lynton at this time, mostly stag hunting, a pursuit which had no inducement for Cook, I need not say, though two of us (Talfourd and myself), when the horses and hounds passed us on the road, could not resist the temptation to see the only wild stag hunting left in England, and hastily packed up our sketching traps, secreted them in some foliage, and followed the hunting party as best we could on foot.

I must not forget to mention the kindness and hospitality shown to our party by Colonel Crawley and his wife, Lady Cremorne, who, being residents, invited us all to their charming cottage orné, where Cook, as usual, was made the lion of the party.

Perhaps the next event to be mentioned in connection with Cook was his visit to North Wales in 1855. This was originated very much by myself; having by chance heard of a cottage called Garth Isa, near Dolgelly, which had been occupied on a previous occasion by Sir Robert Collier's family. I accordingly wrote to the owner, and secured it for ourselves, our party being Cook, Mitchell, Bell, Talfourd, and myself. On our way we stopped a night at Church Stretton Station, and spent the following day most agreeably at the hospitable home of Mr. Moore, of Lindley Hall, who had given us a previous invitation there. After dinner the *Times* was brought in, and it contained the news of the taking of Sebastopol, at which there was great rejoicings. This fixes the date of our visit. On arriving the following day at the cottage of Garth Isa, which none of us had seen, we were agreeably surprised to find it most charmingly situated on the Barmouth Estuary, and nearly at the foot of Cader Idris, the second highest mountain in Wales. The cottage itself was a gem—our sitting-room panelled with oak from floor to ceiling, and altogether a perfect home for artists.

Cook sketched in all directions most perseveringly, old dilapidated cottages, the Barmouth Estuary, Cader Idris from the opposite side, and other subjects which he soon found out, including one halfway up the mountain, from whence we were driven by a storm of rain. Before we had been here many days, however, we had a sudden and unexpected visit from Sir Robert Collier, who had come from Bettws-y-Coed, a considerable distance, on purpose to induce us to join him *there*. We had no room to put him up for the night, and either he or some one else (I think it was Bell) had to sleep for a night or two on the landing; but it did not

matter, nothing disturbed us, and we thoroughly enjoyed the fresh mountain air, and equally, I think, the Welsh mutton. But go to Bettws we positively *must*; the vivid description given of that home of artists by Sir Robert settled us, and we prepared to start. A very early rising one fine morning, and a walk across the sands, brought us to Barmouth in time for the coach, on which, I need not say, we were all outside passengers.

Passing through Beddgellert, where we stopped for a night, we proceeded up to the "Penygwryd Inn." At the head of the Llanberis Pass we began to see and feel the grandeur of Welsh mountain scenery. The effects on that particular day happened to be most felicitous, and Cook and Mitchell were in ecstasies, the clouds partly hiding at times the extreme top of the Snowdon range, the whole of which assumed a deep purple such as we had never seen before. The immensity of size and space disclosed to us was all calculated to impress us, whether artists or amateurs, with the grandeur we were entering on.

At length we drove up to what was then a small roadside inn, the well-known "Royal Oak" of Bettws-y-Coed, made celebrated by that Michael Angelo of water colour art, David Cox, who visited it consecutively for forty years, and who painted the sign, then nailed to the wall of the house, which sign has recently been the subject of so much litigation. We soon found ourselves installed in the then only sitting-room, adorned with a landscape and a life-size figure, both painted on the wall of the little parlour by David Cox. We were all impressed with the artistic atmosphere of the place. Here we found other artists, and with ourselves the little inn was quite full, Cook occupying a double-bedded room with myself; Sir Robert Collier, Harding the artist, Syer, and others, located near at hand. The next morning we explored this village and its neighbourhood, recognizing at every turn subjects of David Cox with which we were all familiar; Cook and Mitchell in a seventh heaven, in raptures with the picturesque beauty of this most artistic locality. We soon got to work, Cook astonishing us all by his grasp of new subjects, and making the resident as well as the tourist artists stare with surprise to see what he did in out-door sketching. Here was no salt sea wave, no coast, nothing but what was new to him; but Cook *felt* his subjects at once. The pastoral meadows, the rocky streams, the bloom on the hills peculiar to Wales, all came naturally to him; he saw them,

he loved them, and he painted them as none had ever painted them before, with his own especial and characteristic mind, and heart, and hand. We took excursions to Llyn Idwal and the Ogwen Falls, to the Dolwyddelan Valley, to Penygwryd, to Capel Curig, to Llyn Craftnant, Llyn Elsy, Fos Nobbyn—now called the Fairy Glen—and various other places, Cook sketching vigorously, and all day long, always making one good sketch a day, and enjoying *for him* very fair health and strength, though on one day, when he had walked to Llyn Craftnant, some five miles, to make a sketch, and returned late to dinner, I was alarmed by his pallid and worn expression of excessive fatigue. This was the first evidence I had of his failing health. After dinner he rallied, and joined in the chorus of a song (sung capitally by Mr. T. Earl, an artist) whilst he quietly smoked his cigar. He never missed a single day making a sketch. Mr. Earl wanted to buy some, and told me Cook's sketches were cheap at seven guineas each. Cook did not part with any, as he wanted to paint from them; as he truly said, "They are my stock-in-trade." As an outdoor sketch in this locality there is none better than the one he made from close to the Bettws bridge, looking up the river. When I last saw that sketch it was in the possession of Mr. Liscombe, of Tamerton. But all his sketches were gems of art. The Llyn Craftnant he made a fine drawing from afterwards. He brought home the essence of North Wales in his folio, declaring it was the finest country he had seen, and, comparing it with his tour in Switzerland, considered Wales much more paintable, and more within the range of art.

Talfourd and I ascended to the top of Snowdon with Sir Robert Collier, but Cook was afraid to encounter the fatigue.

The following year some of us went again to Bettws-y-Coed, Mr. Penson, of Plymouth, and Mr. Philp, of Falmouth, being of the party; but on this occasion Cook did not go. We found old David Cox there, and made his acquaintance. It was the last visit he ever paid to Bettws.

Cook's last sketching trip was at Clovelly, North Devon, in 1858. There again Talfourd, Philp, and myself were of the party; Mitchell, being otherwise at Bideford, could not join until I had left. We lodged together in the steep street (if it can be called a street where no wheels travel), and here of course Cook was in his element and his glory. Fine bluff headlands running out into the sea, Lundy Isle in the distance, the picturesque quay

with the shipping and boats, the wooded banks running down to the shore, the old houses on and near the beach, Hartland Point, the pebbly beach—all afforded subjects especially suited to him. He had gained greatly in experience of outdoor sketching, and he was now amongst the subjects he mostly loved and was most familiar with.

Fortunately for all of us, and for Cook in particular, my friend Mr. Hook, the Royal Academician, was at this time staying at Clovelly, and painting those pictures which have made his name pre-eminent in the art world for their speciality. Those who visit the Royal Academy exhibitions are obviously familiar with Mr. Hook's powerful and truthful sea-coast subjects; for there are none that will compare with them. Mr. Hook was at that time an Associate in the Royal Academy, and I remember predicting to him that he would certainly receive his promotion at the next election, which prediction was realized. In Samuel Cook, whom he had not before seen or heard of, he found a kindred spirit, and these distinguished artists soon fraternized, compared notes, discussed art subjects, and became friends. Mr. Hook painted only in oil, and Cook at this time only in water colour. These vehicles formed, perhaps, the chief distinction between their works. They both intuitively felt and expressed the beauty of *the sea*, with its ever-varying colours, and shadows, and forms. So much is there in association that, ludicrous as it may seem, I have quite fancied I could smell the salt water when looking at one of Hook's powerful sea subjects. No one has ever equalled him in his peculiar line, not even Stanfield, in my opinion. Stanfield, indeed, on being shown some of Cook's sketches, expressed the highest admiration of them, and Hook, since the death of our friend, the subject of this paper, has spoken to me of his appreciation of his genius.

We spent much time in Mr. Hook's company at Clovelly, and my holiday having expired, Talfourd and I left him and Cook, with Philp, still sketching there, where they were subsequently joined by Mr. Mitchell.

A drawing made by Cook from one of his best sketches on this occasion was exhibited in London, and the late Tom Taylor wrote the criticism on it, already referred to. This drawing was eventually purchased by the late Mr. Alfred Rooker of this town, and no doubt is still in the possession of his family.

Having thus alluded generally to what Cook did out of doors,

by way of annual study from Nature, I will refer to other works of his, some of which were executed earlier than the sketches named.

Mr. Mark Grigg, of Tamerton, an appreciative judge of artistic talent, gave Cook, many years before his death, a commission to paint two oil pictures on panels, to be affixed to his dining-room walls at his house at Tamerton. The subjects chosen were most appropriately the bringing in the stream from the Meavy by Sir Francis Drake, and the Spanish Armada. These fine pictures were made from studies first carefully prepared, the costume and accessories of the several figures having been supplied by Col. Hamilton Smith. One represents Sir Francis Drake and a party of figures at a spot near, but rather below, Sheepstor Bridge. The other represents the Spanish Armada immediately after its defeat, in the naval engagement with the British ships. These panels measure five feet by two feet each. The two sepia sketches, Cook's studies for the panels, are before you.

In order to obtain correct materials for this latter work, Cook, when in London, went to Somerset House, purposely to inspect and make drawings of models of ships of the period. Nothing ever done by Cook *in oil* was so fine or so important as these two panels. He was in doubt at one time, and probably at this time, whether to confine himself to oil or water colour, or whether to paint occasionally in both vehicles; but he was not long in deciding, and his oil pictures or sketches are very few, for he kept to water colours after this.

In another vehicle, viz., that of "distemper," he was quite an adept, and he could have made his fortune in London as a scene-painter. The examples of David Roberts and Clarkson Stanfield, both Royal Academicians, would have quite justified his following them as a professional scene-painter, and I have heard Cook say that what he did in the scene-loft helped him materially to a freer execution. What he did do as a scene-painter is soon told. George Wightwick wrote a play called "Richard I." This historical drama was produced at the Plymouth Theatre by Mr. Newcombe, the lessee, in 1848. Col. Hamilton Smith made sketches for the scenery and costume, and Cook painted each of the scenes from Col. Smith's sketches in a most vigorous and artistic manner, astonishing Col. Smith, Wightwick, and myself, as well as many other friends, with his apparent knowledge of this comparatively new class of art to him. I watched him at work in the scene-loft

of the Plymouth Theatre ; his execution was that of his own refined water colour art seen through a magnifying glass, enlarged without coarseness, and fitted to be seen *properly* only at a distance, as was intended. Such scenery has never since been seen inside our theatre. If it had a fault it was too good work for *scenery*, and when one reflects that all that fine art was doomed soon to be annihilated—painted over and forgotten in the exigencies of the scene-room, one almost regrets that such valuable time and labour has been lost to posterity.

The scenes he painted for Mr. Wightwick's play were :

1. Meinhard's Castle on the banks of the Danube.
2. King Richard's Prison-room in the Castle of Durnstein.
3. The Tower of London.
4. Queen Eleanor's Audience-chamber.

The play was first produced on Monday, 21st February, 1848.

The King's Prison-room scene, owing to press of time, was positively not begun until the evening, about two hours before it was needed in the first act. It will appear incredible, but Mr. Newcombe can vouch for the positive fact, that the canvas having been previously *primed*, that is, covered with the neutral prevailing tint of the scene to be painted, Cook actually painted and finished this scene in those two hours. Of course it was not painted with the care and nicety it would have received under ordinary circumstances ; but to have painted it *at all* in a presentable form, in such a time, will always remain one of the wonders of the scene-loft of the Plymouth Theatre.

A curious and amusing fact may be mentioned in connection with this scene. Richard the King had to escape through a "practicable" window, in which a bar, supposed to be of iron, had been inserted by the stage carpenter. Cook, with his usual poetic feeling, had represented this scene under the effect of moonlight, and had thrown a shadow of this bar across the wide embrasure of the window. The King had to tear away this bar to effect his escape, and he did so, and escaped accordingly. The bar was gone, and lay on the ground ; but the shadow remained as a memento of the excited hurry in which the scene had been painted. Probably it was not noticed by the audience, who, perhaps, thought more of the King's escape than the artist's escapade. We can imagine how Col. Smith, Wightwick, Cook, and Newcombe had a good laugh over this in the green-room that evening after the play.

Cook also painted scenery for another play of Wightwick's called "Henry II."

Cook subsequently painted a stock landscape scene for Mr. Newcombe, which did service for many years, but has long since been painted out; and he also painted, as I have already mentioned, the scenery for the spectacle of "Aladdin" for the Plymouth Theatre at an earlier date.

The only other scenery painted by Cook, besides what I have referred to at the theatre in Vauxhall Street, were two scenes for private theatricals at my own house—one representing a French landscape, with cobblers' stall, for a piece called "The Wonderful Woman," in which that gifted lady, the late Lady Trelawny, played the chief part; and the other scene an interior of a small lodging-house for the well-known farce of "Box and Cox."

I was living at this time (in the year 1848) at a small house in Alfred Street, and well remember the surprise of my audience at finding themselves looking out on an extensive and cheerful landscape, making what was really a small back parlour appear of enormous dimensions. This was about the first occasion of the acquaintance, which ripened into a sincere friendship, between Lady Trelawny and Cook, and which lasted till his death. Lady Trelawny entertained the highest respect for his amiable qualities and his artistic ability, whilst his regard for her was only equalled by those others of us who knew her well. When she came to reside at Plymouth with my old schoolfellow, her husband, Sir John Trelawny, she soon found out George Wightwick, or he her. He said of her, that he had never met with any one who comprised so much sense and sensibility. She went to all his Shaksperian readings, and soon identified herself with all that was artistic, whether dramatic or pictorial. She fraternized with the artist and amateurs as if she had been one of themselves, and she was beloved by all. Wightwick was one of the first; but Colonel Smith, Mr. Johns, and many others, soon recognized her rare gifts of intellect and character. It was impossible for any of us to be in her society without falling under the spell of a strangely fascinating and sympathetic personality, and in these characteristics she must have resembled the late Mrs. Cross, known as George Elliot.

She was a very frequent visitor to Cook when at work in his studio, where she was always welcomed; and he presented her

with an excellent sketch made at Wistman's Wood on our first visit to Dartmoor.

Amongst work of a decorative character Cook painted a verandah and landscape on the wall of a small room in the house of Colonel H. Smith, in Park Street, giving an idea of considerable size and space in quite a small compass. I believe this painting is still in existence, the house belonging now to Mr. Charles Skardon.

Reference has already been made to Cook having painted signs for inns when quite a young man. He also painted the sign of the "White Horse," that stood at the corner of Westwell Street, since removed for the new Guildhall, and next door to where Cook himself lived for some years, and painted many of his best drawings. The chief purchasers of his works when residing in Westwell Street were Mr. Bryant, of the Sugar Refinery; Mr. Mark Grigg; Mr. Teed, q.c., of London; and Mr. Skirving, of Plymouth.

Cook's favourite haunts for sketching were in Cornwall, at Polperro, Looe, Kynance Cove, Tintagel and Trebarwith Sands, and Boscastle.

The late Mr. Skirving, of Plymouth, purchased three of Cook's very finest works. They are now in the possession of his widow at Bath. One represents a storm at Tintagel, and the other two are scenes near the Lizard.

On three separate and distinct occasions I have got together for public exhibition a series of Cook's best drawings. Firstly, at a *conversazione* at the Devonport Mechanics' Institute; next, in the year 1873, on a much larger scale, on the occasion of the visit of the Bath and West of England Agricultural Show, held at Pennycomequick, I collected fifty of Cook's finest productions; and lastly, at St. Andrew's Hall, Westwell Street, in the year 1877, when the British Association held their meeting at Plymouth. On each of the two latter occasions all Cook's most important works were got together. Catalogues of both exhibitions are still in existence, showing the names of the possessors who kindly lent them for exhibition, and the names of the subjects. I knew where all these drawings could be got at, asked for them, and had them; not one was refused. One of the finest works Cook painted was lent by Lord Selborne, who purchased it when he was Sir Roundell Palmer. His appreciation of it, and of the moderate sum he paid for it, are well expressed in a note he

wrote to Cook. The drawing referred to is a panoramic view of Plymouth, taken, I think, from Mount Batten. A still finer work of Cook's, an evening effect at Polperro, is also the property of Lord Selborne.

It has already been said that two features in Cook's life deserved especial mention. I have referred to one of them; namely, his regular out-door studies from Nature, which served to keep his eye familiar with colour, form, and effect, and, having a good memory, these studies from Nature contributed much to the truthfulness of his representations.

The second noteworthy feature in Cook's life was his place in the Plymouth Society of Artists and Amateurs—a society which originally existed long before Cook came to Plymouth. I remember as a young boy in about the year 1830 this society existed, and as a mere child was allowed to look on at several gentlemen collected together of an evening, all making drawings. Amongst these were Col. H. Smith, Wm. Jacobson, Mr. Ball, George Wightwick, A. B. Johns, a Mr. Scanlan, Mr. Holmes, a drawing-master, Mr. J. L. Colley, Mr. Norman, the banker, and an art connoisseur of Devonport—who had a fine gallery of old masters—Mr. C. C. Whiteford, and my father. Of these, all have passed away except Mr. Colley and Mr. Whiteford. The little society for some unexplained cause died out, and a considerable interval elapsed, when, about the year 1848 (by which time Plymouth had acquired several new artists, who were residents, including Cook, Opie, Talfourd, Mitchell, Penson, Lane, Luscombe, Giles, Williams, and others) Col. Smith and Mr. Johns, with some others of the survivors of the old society, set to work to reconstitute it, and did me the honour to ask me to act as Honorary Secretary. The new society was accordingly formed, and for about ten years was well maintained, both by artists and amateurs. We met at each others' houses once a fortnight, and the rule was for everyone to make a drawing and leave it at the house of the member where it was made. We drew from eight till ten, and then had supper and much artistic gossip till about twelve. The genial fraternity of this little society can only be understood and appreciated by those who at the time belonged to it. Need I say that Cook was the *facile princeps* of our club? that he was the one of all others, whether artists, amateurs, or visitors, that we all looked up to as the ruling spirit and genius of our party? Considering his delicate health Cook was very regular in his attendance on

these occasions, and many are the exquisite little drawings, always in sepia, which he made at these meetings. I am fortunate in possessing several, but as they are kept in a folio have not brought them here, and have borrowed from Mr. Norman one of the best of these by Cook that I ever remember his making—a perfect marvel for simply two hours' work. It is difficult to estimate the artistic value of these refined poetic and delicate works.

At each house a new gathering of visitors was generally to be met with, and this led, perhaps more than anything else, to Cook being known and appreciated in society. Visitors who were neither artists or amateurs soon observed the homage paid to Cook by all who were acquainted with art, and were not long in discovering the refined qualities of his character. In this way he acquired a large circle of appreciative friends, and I can believe that the acquaintance of many of them became a great pleasure and source of happiness to Cook for the rest of his very limited life.

When we had followed to the grave three of the chief members ; viz., S. Cook, Col. Smith, and Mr. Johns, the society ceased to exist.

Want of health, studious habits, and a singularly retiring disposition, united to keep Cook from mixing much in general society, though he was qualified to adorn the best, and had the best in this neighbourhood at his disposal. Considering that he received no education since the humble one of his early youth, save what he acquired for himself, his intellectual culture was remarkable, and his acquaintance with literature, especially poetry, was very considerable.

A society of artists and amateurs on a very important scale has existed for many years in London. They meet once a month at Willis's Rooms. At these meetings no drawings are made, but the folios of artists and amateurs are previously collected, and are arranged under powerful gaslights, and seen to great advantage. These meetings are not only frequented by many of the fashionable world of London, but also by dealers anxious to make the acquaintance of promising artists. It was at one of these brilliant conversaziones that a folio of sketches by Cook was being exhibited. Cook, Lady Trelawny, and myself, had met and gone there together. She and I watched with interest the remarks made on Cook's sketches, as they were turned over one by one in the folio by many a connoisseur of art that night. Harding, the artist, was quite

delighted with them, and pointed out to his friends their especial qualities of light and air. Many there amongst the crowd of visitors had never heard of Cook. His folio was beset by artists, amateurs, and dealers, and some noted dealers asked him that evening if he would accept commissions from them. I never saw him made so much of. As he left the suite of rooms at midnight with Lady Trelawny on his arm, it was a night that might have made him proud; but Cook was proof against flattery, and far above it; nothing could spoil *him*. He probably went home to dream of the fine works of art by his contemporaries which we had seen together that night.

To say that Samuel Cook was universally respected by those who had the privilege of his acquaintance would be saying little. He was *beloved* by all who knew him with that intimacy necessary to full appreciation; and amongst those most ready to acknowledge the justice of this eulogy are many of his friends amongst the gentler sex, whose earnest and refined feelings especially qualify them to judge of so gentle a man as Samuel Cook.

It is a pleasure to know that most of his drawings are in the possession of residents in this neighbourhood. They are chiefly made from sketches in Devon and Cornwall and Wales. All his best coast subjects are from Cornwall.

One drawing of Cook's, taken from Stonehouse Bridge, is the property of the nation, and is hung at South Kensington, between a Turner and a Prout.

The sketches themselves, many of exquisite beauty, were found at his death to be very numerous. Under my advice they were sent to London to be sold by auction at Foster's sale-room. His widow asked me to lot them, and put a price on them. I could not refuse this duty, and performed it; but it obviously precluded me from being a purchaser, and I confess that I have never reconciled myself to the sacrifice I felt compelled to make. If I had had nothing to do with *selling* them, probably I should have had a great deal to do with buying them. I gave no commission to buy, and would not trust myself to attend the sale. These sketches averaged from £5 to £7 each, and produced altogether about £500.

It may be expected that I should say something of the *commercial* value, as well as of the *artistic* value, of Cook's works. I need, however, only remark that an artist has first to be well-

known in the art world of London before a demand for his works is created. Even then he is very much at the mercy of dealers, who can almost make or mar any artist, and certainly can regulate the value of his productions. Cook did not live long enough, nor was he sufficiently known amongst picture-buyers to create a demand; he was just beginning to be so when his end was approaching. I believe the most he was ever paid for a single drawing was £40. At his death, and for years subsequently, his drawings realized at the least ten times what he got for them. He was excessively moderate in his prices, and many of his slight out-door sketches sold after his death for considerably more than he had been paid for the finished drawings he made from them. I cannot refrain from adding that the number of copies which have been made from his works must have materially operated against the sale of the original drawings. Good judges have been deceived by these copies, and the general public might readily be. No one should be blamed for *copying* Samuel Cook; let blame be reserved only for those who sell such copies under the pretence that they are originals.

Cook's failing health assumed a serious aspect about January, 1859, when he was laid up in bed at his then residence in York Street. I saw him in this state, and took him some drawings of London artists to see, and they interested him much. He talked to me of some pleasant times we had had together, and it was clear from what he said that he was impressed with a belief he was not going to recover. At his request I made a short will for him. The last drawings he had made were then exhibiting at the Water Colour Gallery in London. One of them I am very happy to possess—a foggy morning at the Lion Rock, near the Lizard.

Under the medical advice of Mr. Square, who was attending him, he was then removed to West Ham, a lodging-house on the old Saltash Road. There I saw him as often as circumstances would permit, Mr. Mitchell and other intimate friends doing the same. On each occasion we noticed that he was losing ground, evidently sinking from sheer exhaustion. The greatest anxiety and sympathy were felt for him during this illness by a very large circle of friends who had learnt to know him and respect him. Amongst these the late Earl of Mount Edgcumbe was good enough to offer him a suite of apartments at the Winter Villa, at Stonehouse, or the use of his steam-yacht to take him to the Mediter-

ranean; but it was too late—consumption had set in, and he was doomed.

He died on the 7th June, 1859, at the age of fifty-three, and he was buried at the Plymouth Cemetery, his funeral being very largely attended.

The same day that took him from us deprived us also of that patriarch of water colour art, "Old David Cox." For this loss we were, however, prepared; for the great master's sun had long reached its zenith, and all knew that the hour of inevitable eclipse was nigh; but Samuel Cook went down at noonday, in the fullness of power and promise, each succeeding season being marked by increasing excellence. Had he been spared to us but a few years longer, it is very certain that he would have had no superior, and but few equals, in his own especial field of art.

To the student he left a sterling lesson of humility, perseverance, and that patient study without which even genius such as his was can never hope to accomplish great results. Emphatically a self-made man, he raised himself by his virtue, no less than by his talents, to a position of universal respect and esteem, and he left a name which will be long and affectionately remembered as that of a great artist and a good man.

LIST OF SOME OF THE BEST-KNOWN WORKS OF THE LATE SAMUEL COOK, ARTIST.

PICTURES IN OIL.		POSSESSOR.
Sir Francis Drake bringing in the Plymouth	}	Mark Grigg, Esq., Tamerton.
Leat (on Panel)		
The Spanish Armada (on Panel)		Ditto.
DRAWINGS IN WATER COLOUR.		
The Dolwyddelan Valley, North Wales.		Ditto.
Storm, Countisbury Crag, Lynton		Ditto.
Bossiney Bay, Cornwall		Ditto.
Tintagel, Cornwall		Ditto.
Kynance Cove, Cornwall		Ditto.
Trebarwith, Cornwall		Ditto.
Boscastle, Cornwall		Ditto.
A Storm at Tintagel		Mrs. Davies, Circus, Bath.
Sea Coast near the Lizard		Ditto.
Ditto ditto		Ditto.
View of Plymouth	}	Lord Selborne, Portland Place, London.
Polperro, Cornwall		
Entrance to Fowey Harbour		Ditto.

DRAWINGS IN WATER COLOURS.	POSSESSOR.
View of Plymouth from the fields above	{ M. J. Collier, Esq., Fox- hams, Horrabridge.
Oreston	
The Mewstone—Twilight	Ditto.
Waiting for the Tide	Ditto.
Entrance to Fowey Harbour	Ditto.
Dartmouth Harbour	Ditto.
The Wengern Alp	{ C. C. Whiteford, Esq., Thorn- hill, Plymouth.
Lion Rock, near Lizard—Evening	
Ivy Bridge	— Prance, Esq.
	Ditto.
Lion Rock—Morning. Fog clearing off	{ William Eastlake, Esq., Plymouth.
Trebarwith Strand	
Anstey's Cove, Torquay	Ditto.
The Devil's Point	Ditto.
Polperro, Cornwall	Ditto.
River Scene—Bettws-y-Coed, North Wales	R. L. Liscombe, Esq.
On the Lyn, North Devon	Ditto.
Mewstone	Ditto.
Ascent of Snowdon	Ditto.
Fowey Harbour	Ditto.
Whitsand Bay	Ditto.
Trebarwith, Cornwall	— Bartlett, Esq.
The Plym	{ George Soltau, Esq., Little Efford.
Tintagel	Ditto.
Bridge on Dartmoor	Ditto.
Barn Pool, Mount Edgcumbe	H. Brown, Esq., Plymouth.
Kingswear Castle, Dartmouth	Ditto.
Landscape—Autumn	The late G. D. Radford, Esq.
Fowey Castle	Ditto.
Coast Scene, North Wales	Ditto.
Stoke Gabriel, on the Dart	Ditto.
	{ B. W. Leader, Esq., The Lodge, Whittington, Wor- cester.
Trebarwith (an outdoor sketch)	
Kynance Cove, Moonlight	{ Miss Harris, Long Sutton, Somersetshire.
Mount Edgcumbe from the Devil's Point	Ditto.
Entrance to Fowey Harbour	{ A. C. Bell, Esq., Thames Chambers, London.
Coast of Cornwall	Ditto.
The Lizard Lights—Stormy Sea	{ Francis Hicks, Esq., Bur- rington.
Polpeir Cove, near Lizard—Sunset	Ditto.

THE DEPTHS OF THE OCEAN.

SYLLABUS OF LECTURE BY CAPTAIN INSKIP, R.N., F.R.G.S.

(Read February 3rd, 1881.)

THE bed of the deep sea until recent years an unknown region. Sounding and dredging. Supposed sudden dip in the bed of the North Atlantic, off the Irish coast. Porcupine's expedition in the North Atlantic in 1869—first cruise, second cruise, third cruise. Porcupine's expedition southward to Strait of Gibraltar, and up the Mediterranean in 1870—first cruise in North Atlantic, second cruise in Mediterranean. Notes on the *Challenger's* work—In the Atlantic; in the Southern Ocean; from Australia to China. The deepest sounding. In the Pacific. Concluding remarks.

HABITATION OR ENVIRONMENT?

A CHAPTER IN THE THEORY OF EVOLUTION.

SYLLABUS OF LECTURE BY MR. F. H. BALKWILL.

(Read February 10th, 1881.)

MEANING of the word "habitation" contrasted with that of the word "environment." Gradation of life. Correspondence between habitation and life. Examples given. The salmon, grizzly bear, and camel. Evidence of the nervous system with regard to correspondence between consciousness and the *habitation*. Diagrammatical representation of an ascending series of habitations. Meaning of correct biological classification. Line of descent of man. Man defined by the use of language or weapons. Query which? Conclusion.

THE METEOROLOGY AND CLIMATE OF
PLYMOUTH.

BY DR. J. MERRIFIELD, F.R.A.S., F.M.S.

(Read February 17th, 1881.)

METEOROLOGY is a term which most people understand even if they cannot define, and an assumed knowledge of weather forms almost a part of an Englishman's existence. This may be accounted for, and perhaps is accounted for, by our geographical position. Pushed out as it were to the very verge of Western Europe, we are surrounded by the "melancholy ocean," which Lord Beaconsfield suggested plays such an important part in the Irishman's character. In passing I may remark that in this he was neither original nor singular, as Albert Guyot many years before attempted to show how character was modified by man's natural environments. To return; at the same time we lie in the direct track of the Gulf Stream and of the Return Trade Winds; hence I think we may fairly charge to our geographical position many of the changes which we experience. This being conceded, what wonder then that the weather is such an unfailing source of conversation amongst us. We can hardly imagine meeting a friend, and after shaking hands with him, and exchanging the usual salutations, not saying, "A fine morning," or "Gloomy, isn't it?" or, perhaps, "Very cold;" whilst others, with a far deeper pretence to weather knowledge, may remark, "I think we shall have a change," or, "This weather won't last." But how many an average Englishman can tell what he means by weather, by climate, or by meteorology?

By *weather*, I mean the condition of the atmosphere at any particular time in a certain place. It simply says whether it is raining or not, whether hot or cold, and tells of the direction and strength of the winds, the pressure of the atmosphere, &c., at a specified place at any particular moment.

By *climate*, I mean the average of all weathers experienced at

that place when the mean is taken over a very long time. Weather is changeable within very short periods; climate is uniform except in its secular changes; *i.e.* for very long periods. Time enters as a factor into weather; from climate time has been eliminated. "Climates are different in different places; whereas the weather, though changeable in any one place, may be the same at the same time in many places." Thus we may consider climate as the integration of weather; and conversely, weather as the differential coefficient of climate.

By *meteorology*, "I understand the description and explanation of those phenomena which group themselves under the head of weather, of the seasons, and of climate." (Sir J. Herschel) Another writer (Dr. Mann) says, "Meteorology is the scientific study of atmospheric phenomena, and the investigation of weather and climate." (*Meteorological Lectures*.) I hardly need to tell this audience that the term has not always been so restricted; for at one time it was applied to the consideration of all appearances in the heavens, astronomical as well as atmospheric; and some have derived the term from meteors or falling stars; whilst others say it is derived from *μετεωρος* which signifies elevated or soaring. To obtain the climate of a place we must have organized and systematized meteorological observations extending over a very long period. Since I have been in Plymouth, I have endeavoured to do this for my adopted town, and I now offer to the Plymouth Institution the results of my sixteen years' work; and I feel obliged to its members for accepting them, because with me it has been a labour of love. I am fully aware that all the instruments I have used (especially my rain gauge) are not so well placed as perhaps they would be, if someone who has greater facilities for exposure will take the matter in hand. I have done my best with such means as I have at command, and failing all other consecutive observations mine must be accepted for what they are worth.

GEOGRAPHICAL POSITION—The situation of my house has been found from repeated astronomical observations to be in latitude $50^{\circ} 22\frac{1}{2}'$ N., and longitude $4^{\circ} 7\frac{1}{4}'$ W., and it is at the north-eastern end of the town, 69 feet above the mean sea level. Plymouth itself is situate a little to the south-west, but sufficiently near for the results here found to be taken for those of the town. It lies on the west bank of the estuary of the Plym, where it falls into

the Sound, and is about four miles north of the open English Channel. It is sheltered on the south-west by Penlee and Maker Heights, which rise to an elevation of about 400 feet ; and on the north-east by the high lands of Mannamead and Hartley, from 300 to 320 feet high. Towards the east and south-east it is more open, but still sheltered by Staddon Heights, which are from 300 to 400 feet high. On the south the Hoe rises in some parts to a height of 110 feet, with the ridge on an average of 100 feet. Thus the town itself is sheltered, and observations here for wind force are no criterion of their force in the Channel. This was one of the reasons why the Royal Society's station for meteorological observations was removed from Plymouth. The other was, because I could give no information concerning the true state of the sea—the Breakwater and land-locked harbour preventing anything like correct observations being made ; and as indications of coming storms are propagated much quicker through the waters of the ocean than through the atmosphere, it was necessary to select a station where the wind pressure would not be interfered with, and where the sea-disturbance would be modified as little as possible by surrounding circumstances. Hence Prawle Point was substituted for Plymouth, a change I much regretted, although it is one for the benefit of meteorological science.

BAROMETRIC PRESSURE.—The rise and fall of the barometer is one of the surest indications of coming changes ; and hence the importance of attending to its readings. Although one of the *surest* indications, it is not the first ; for here in Plymouth I have repeatedly observed after fine cold weather that a rise in temperature is the first sign, and then the wind frequently shifts to south or south-west before the barometer begins to fall. This, I believe, is the normal order which changes of weather follow in our islands. I showed in the last paper I had the honour to read before this Society how storms were most surely foretold from comparison readings of the barometer ; but as my subject to-night is the weather and climate of Plymouth I must say no more on that subject. The barometer I use is a standard one by Adie, of the Kew pattern, and the readings are reduced for temperature, altitude, capillarity, and index error, by a table supplied from the Meteorological Office, London ; but no reduction has been made for diurnal range. The height of the mercury in the barometer

depends on the quantity of air above the instrument as well as on the density of the atmosphere. It is clearly seen that the situation of the barometer must influence the height of the mercury, because if situate on the summit of a high mountain, it is manifest there cannot be as much of the atmosphere above it as if it were placed in a deep valley at its foot. It is calculated that at a height of three miles; *i.e.* just at the summit of Mount Blanc, one-half the whole atmosphere lies below it; and at six miles three-quarters lies below; whilst at eight miles all animal life, as we know it, must become extinct. Hence for comparison between different observers it is needful to reduce all readings from places differently situated to one standard height, and the standard selected is the mean sea-level.

Again, to any one who has thought on the subject, it is manifest the air must be much denser; *i.e.* heavier bulk for bulk, when it is cold than when it is warm; and hence comes the necessity for a second standard; *viz.*, one for temperature, and the one selected is the freezing-point of fresh water.

Thus, after correcting the readings for capillarity and index error, other corrections must be made for the height of the barometer, and for the temperature of the atmosphere. In my case I found the height of my instrument above our standard line by first obtaining from the office of the Royal Engineers the height of the nearest bench mark made during the Trigonometrical Survey, and levelling from thence to the position my instruments are placed in. I thus found the cistern of my barometer to be 69 feet above mean sea-level. In making reductions for altitude and temperature, the rules given in form 14, issued from the Meteorological Office, are near enough for all practical purposes. They are as follows:

(1) Each ten feet of vertical height causes one-hundredth of an inch diminution; *i.e.* for each foot above mean sea-level add one-thousandth of an inch to the barometrical reading.

(2) Each 10° Fahrenheit above 32° causes very nearly three-hundredths of an inch increase, or for each degree Fahrenheit above 32° subtract three-thousandths of an inch from the pressure shown by the barometer.

The atmospheric pressure in Plymouth has fluctuated between 30.822, the maximum on 15th December, 1865, and 28.316, the minimum in the morning of the 24th January, 1872, a difference

of $2\frac{1}{2}$ inches of mercury. It is but seldom the pressure here falls below 29 inches, this having occurred only forty-eight times in the sixteen years. The month of greatest mean pressure is June, the average being 30.022; the month of least pressure is October, the average being 29.888. These averages form no guide to the months of greatest extremes, which mostly concern us as residents in a maritime town, because in these months we get the strongest winds, and they therefore bring disasters to our relatives and friends who go down in ships on the great waters. These months are the winter months of December (1.368), January (1.412), and February (1.303). Our average pressure for the year is 29.945 inches.

TEMPERATURE.—By temperature I mean the heat shown by an exposed thermometer. In Plymouth we have few of the extremes of heat and cold which places more inland experience. The chief reasons are the following: Maritime places on western seaboard, if situate in the Temperate Zones, are in the direct path of the Return Trade Winds. These winds have been heated in the Torrid Zone, and there ascend, giving up their heat to limitless space; and in their ceaseless journey towards the poles again descend in about 30° or 35° of latitude, but have a westerly tendency given to them because they come from a portion of the earth where the daily rotation is much quicker than at places nearer the poles. Hence they blow from the south-west in north latitude, and from the north-west in south latitude. But before they reach us they pass for thousands of miles over the ocean, and this (from the great specific heat of water) again makes them hot, and thus they reach us as warm, wet, south-west winds. By specific heat I understand the amount of heat necessary to raise a unit of a substance a unit in temperature. This may be better understood thus: Let us take a pound of water, and also a pound of mercury at the same temperature, and similarly expose them to the same source of heat, as a steam-chest or sand-bath. We shall find that although we have equal masses of the two substances, yet the mercury will get hot the quicker, and will rise in temperature a certain number of degrees, thirty times as quickly as the water will. Now because the two substances are similarly exposed, it is evident there must be thirty times more heat absorbed by the water than by the mercury to produce the same thermal effects. Water, we say, has

thirty times the specific heat of mercury, and as water is taken as the standard, the specific heat of mercury is $\frac{1}{30}$. The specific heat of air is $\frac{1}{32\frac{3}{4}}$ of that of water; hence the energy which will raise the temperature of a unit of water 1° of Fahrenheit will raise the same unit of air 3234° F. Again, to form vapour at atmospheric pressure it requires nine hundred and sixty times as much heat to pass into boiling water as it would to raise the same weight of water one degree. Tyndall, in his *Heat as a Mode of Motion*, has most vividly put this property of water in the following striking form (Art. 240): "The latent heat of aqueous vapour, at the temperature of its production in the tropics, is about 1000° F.; for the latent heat augments as the temperature of evaporation descends. A pound of water, then, vaporised at the Equator, has absorbed one thousand times the quantity of heat which would raise a pound of the liquid one degree in temperature. But the quantity of heat which would raise a pound of water 1° would raise a pound of cast-iron 10° ; hence, simply to convert a pound of the water of the equatorial ocean into vapour would require a quantity of heat sufficient to impart to a pound of cast-iron $10,000^{\circ}$ of temperature. But the fusing point of cast iron is $2,000^{\circ}$ F., therefore for every pound of vapour produced a quantity of heat has been expended by the sun sufficient to raise five pounds of cast iron to its melting point." From these two causes (specific heat of water and latent heat of steam) the temperature of the ocean itself is raised but a small amount, whilst it gives to the Return Trades their heating power. Then, as the water cools and the vapour condenses, they give out just the same amount of heat to cool as was absorbed by them in getting heated and changing their form; and it must be borne in mind that for every pound of rain that falls enough heat has been set free to melt five pounds of cast iron. The ocean thus acts as a regulator to the heat supplied by the sun. It absorbs the surplus of the Torrid Zone, and of the summer in the Temperate Zones, stores it up, and in winter gives it out as the temperature of the land falls below the surrounding ocean. The Gulf Stream, too, prevents very cold winters in Ireland and South-west England; and although the very existence of such a stream has been questioned, I am willing to accept the fact from such authorities as Maury, Findlay, Wyville Thomson, and others.* The heat liberated

* Dr. Carpenter says the Gulf Stream as a distinct current has not been traced eastward of 30° W.—*Nature*, vol. ix. p. 423.

from the Gulf Stream has been beautifully reasoned out by Croll and paraphrased by Knox Laughton thus: "The heat brought by the Gulf Stream into the North Atlantic has been fairly estimated as not less than one-fifth of the whole heat possessed by the surface water of that division of the ocean. Now Sir John Herschel, and other eminent writers, English and French, have estimated the temperature of space at 239° below zero. If with this we compare the existing temperature of the North Atlantic, which may be taken at 56° above zero, we find that the heat which it actually has corresponds to a temperature of 295° , the fifth part of which is 59° . If then the fifth part of its heat, the heat derived from the Gulf Stream, were taken away from it, the surface water of the North Atlantic would have an average temperature of 3° below Fahrenheit's zero, or 35° below the freezing-point of fresh water." (CROLL'S *Climate and Time*, p. 35, *et. seq.*) Such a calculation may appear almost wild, but it errs if anything in allowing too much heat. I am by no means sure that instead of 35° below freezing-point, I ought not to say 100° .

Another way of considering the effect of the Gulf Stream leads to a result scarcely less startling. A quantity of water, which may be roughly estimated at about five billions of cubic feet, is hourly poured through the Straits of Florida into the North Atlantic. This water has then an average temperature of not less than 65° , and after performing a circuit in the North Atlantic, returns to the tropics with an average temperature of not greater than 40° . It gives out to the air of the North Atlantic the heat corresponding to a difference in temperature of 25° . Now if you will remember that our standard measure of heat—the British thermal unit—is the quantity of heat necessary to raise the temperature of 1 lb. of water 1° , and that a cubic foot of water weighs about 64 lbs., you will see that the heat so thrown out every hour into the air of the North Atlantic is

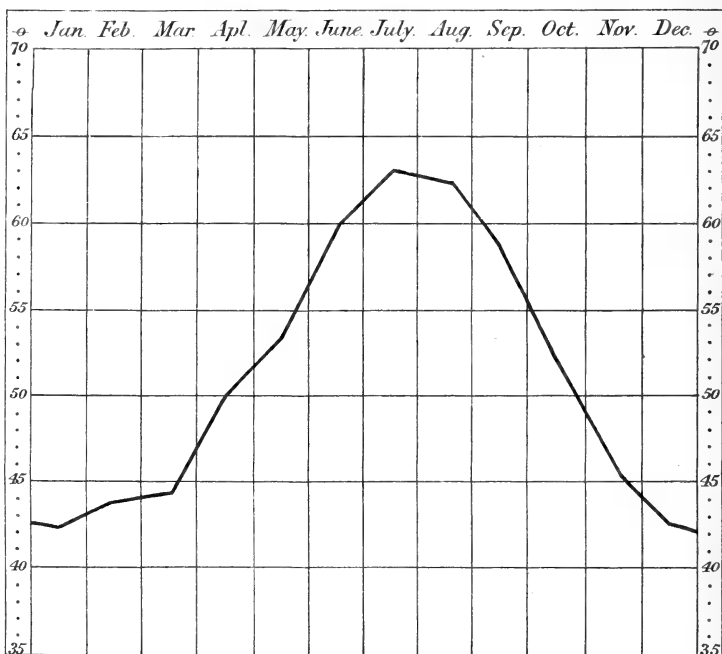
$$25 \times 64 \times 5,000,000,000,000 \text{ thermal units.}$$

Such a row of figures conveys little meaning. I will try to make it more intelligible. Every thermal unit, when converted into power, is capable of lifting a weight of 772 lbs. through a height of 1 foot; this is the law of equivalence experimentally established by Dr. Joule, of Manchester. Consequently the heat hourly dispersed from the waters of the Gulf Stream, if stored up

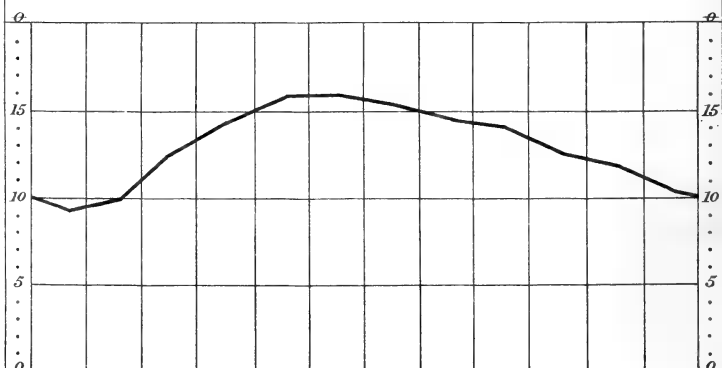
and applied as power, would be capable of lifting each hour $772 \times 25 \times 64 \times 5,000,000,000,000$ lbs. through a height of 1 foot; that is, of doing the work of steam-engines having an aggregate horse-power of 3,119,000,000,000, a power equal to that of nearly 400,000,000 ships, such as our largest ironclads. Now when we remember that south-west Ireland and south-west England, and therefore Plymouth, are situate in the path of the Gulf Stream after its bifurcation, we can then see what influence our geographical position must have on our climate. The effect of vapour in our atmosphere too in modifying temperature has been beautifully shown by Tyndall. He has proved that all perfumes, even from a bed of flowers, prevent in a great measure radiant heat from penetrating through the atmosphere laden with the perfume. Similarly he has shown that only a small percentage of radiant heat passes through vapour of water. Hence, on all sea-boards the vapour always found in the atmosphere, although invisible, acts as a screen to keep away the heat of the sun. This same screen, when the sun is set, or is hidden by clouds, also prevents radiation from the earth, and tends to keep on its surface what heat may have been absorbed by the soil of which it is composed; and thus vapour in the atmosphere secures a uniformity of temperature. Most of us here know that a day's jaunt on Dartmoor under a cloudless summer's sun will burn our skins more than many days' exposure on the sea under similar circumstances; and Tyndall, when ascending the Alps, says the heat from the sun was almost insupportable at the time he was hip-deep in snow. (*Meteorological Lectures*, p. 38.) The reason is to be sought for in what I have already said. Over the ocean the invisible vapour robs the sun of its scorching effects; but on the Moor and on the Alps this vapour has been condensed and deposited in the form of dew, rain, or snow, and then the atmosphere is drier, and the consequence is the scorched skin to those who expose themselves. The effect of an atmosphere with little vapour in it, in allowing radiation to pass through it, has often been forced on my notice; for it has frequently occurred that ice has been formed on the top of my house under a cloudless sky when the thermometers in the screen have not registered below 35° F., or 3° F. above freezing. The material of which the screen is composed, the colour of the paint used, contiguity and direction of surrounding objects, character of the soil, and a countless number of so-called trifles, tend to introduce discrepancies



Curve of Mean Monthly Temperature.



Curve of Mean Monthly Range of Temperature.



between observers who otherwise are as careful as it is in man's power to be. If any one should feel inclined to compare his observations with mine, he should endeavour to place his instruments under similar circumstances, or his comparisons will lose their value. My maximum and minimum thermometers are by Negretti and Zambra. They face due north, and are placed in a screen about 4 feet from the ground and 1 foot from the wall in my office; thus no sun ever falls on the screen, and there is free access for air to play all round them. The mean temperature of Plymouth I have found to be $51\cdot62^{\circ}$ F. This mean would obviously be best obtained by recording for a very long period twenty-four hourly observations, and taking their average; but Buchan, the secretary of the Scottish Meteorological Society, has shown that the arithmetic mean between the maximum and minimum for every day in the year is too great only by a small fraction of a degree; and this is the method I have adopted. The latter parts of the months of April and October give nearly the same means as for the year. Our hottest months are July and August, when the averages are $62\cdot97^{\circ}$ and $62\cdot50^{\circ}$ respectively, thus showing that July has the advantage. Our coldest months are January and December, when the averages are $42\cdot34^{\circ}$ F. and $42\cdot63^{\circ}$ F. respectively, thus showing that January has the least temperature.

Like every other place, we have some extreme readings; but these in Plymouth, as in all the south-west district, are comparatively rare. The maximum temperature in the shade I have ever recorded was on 27th June, 1866, when it showed 93° F.; the minimum was 14° F., on 27th December, 1869. I have many instances of the temperature reaching from 85° to 90° . I find the maximum for the day to be generally from 2.30 to 3 p.m.; but the time is so modified by the seasons, by clouds, and by change of wind, that I have often found the minimum temperature to be in the day and the maximum to be in the night. On some days the maximum has not risen to the freezing-point, the last time being on the 22nd January of this year (1881). The minimum temperature at times has been far above the average monthly temperature, as on August 27th, 1869, when the minimum reached only 67° F. The mean annual range—i.e. the range from the hottest month, July, to the coldest month, January—is $20\cdot63^{\circ}$, whilst the difference between the average maximum and minimum for the year is only $13\cdot13^{\circ}$. Some years we have more than double the annual range, as for

example 1869, when it was 72° F. The months of greatest range are May and June; the months of least range are December and January. The greatest daily range of temperature I have ever recorded was 40° F., on 27th April, 1865—the maximum, 86° , and minimum, 42° F. As a contrast to this, on December 22nd, 1870, I found the daily range only 2° —the maximum, 28° , and minimum, 26° —and on several occasions I have found but 3° range, the last being 14th November, 1880. Great daily ranges are indications of dry weather, because the screen of vapour which I spoke of just now does not exist, or, in other words, there is but little moisture in the atmosphere; but small daily ranges show an atmosphere saturated with vapour which a small decrease in temperature will precipitate in the form of rain. The connection between great daily ranges of temperature and health is an interesting problem for some medical man with time on his hands to solve. Another problem is, Do extreme temperatures, even if they last for some days, affect health as much as great daily ranges of temperature do? If so, in what way? The average temperature at 8 a.m. is 50.82° F., which is within $.88^{\circ}$ F. of the mean for the year. During only the months of May, June, and July is the 8 a.m. higher than the average; hence the mean temperature for the day must be after 8 a.m., and probably between 9 and 10 a.m. The gradual rise and fall of the temperature from month to month is shown by the curve on the diagram, where it is seen that the rise during the first months is much more gradual than the fall during the latter months of the year. Our mean maximum is 58.18° F.; our mean minimum, 45.05° F.; and our mean temperature, as I stated before, 51.62° F.

HYGROMETRY AND RAINFALL.—By hygrometry is meant the estimation of the amount of aqueous vapour in a given volume of the atmosphere. There are several ways of performing this estimation, and hygrometers have been invented by Daniel, Regnault, and others, for that purpose; but the method generally adopted by meteorologists is that suggested by Leslie, and the form in general use is due to Mason—hence is generally called a psychrometer, or Mason's hygrometer. It consists of wet and dry bulb thermometers, from the readings of which, and from empirical tables constructed by Glaisher, can be obtained the dew point, the saturation of the atmosphere, the quantity of vapour in a cubic foot, and other data. Evaporation produces cold, because

heat is abstracted from the substance on which evaporation takes place to produce the vapour; hence in general the wet bulb registers a lower temperature than the dry. The *dew point* is that temperature at which dew begins to be formed. The formation of dew may be seen by any one bringing a glass of cold water into a warm room in which many people have been sitting for some time. The glass gets dim almost immediately, and moisture forms on the outside of the glass. The ratio of the amount of aqueous vapour actually present in the atmosphere to that which it would contain if it were saturated, is called the hygrometric state or degree of saturation. In Glaisher's tables perfect saturation is placed at 100, and according as the air is near or far from saturation, so his numbers approach to or recede from 100. The degree of saturation does not depend on the amount of aqueous vapour present in the atmosphere, but on the nearness of the vapour-laden air to its point of saturation. Thus cold air, with but little vapour in it, may be moist; whilst warm air, containing much more vapour, may be dry. When the wet and dry bulbs act exactly alike it shows the air is fully saturated, and the least fall in temperature will produce rain, because cold air cannot sustain as much water in the form of vapour as warm air can. Thus air at 75° F. contains 8 grains of vapour per cubic foot when fully saturated, whilst at 32° F. it contains only 2.1 grains.

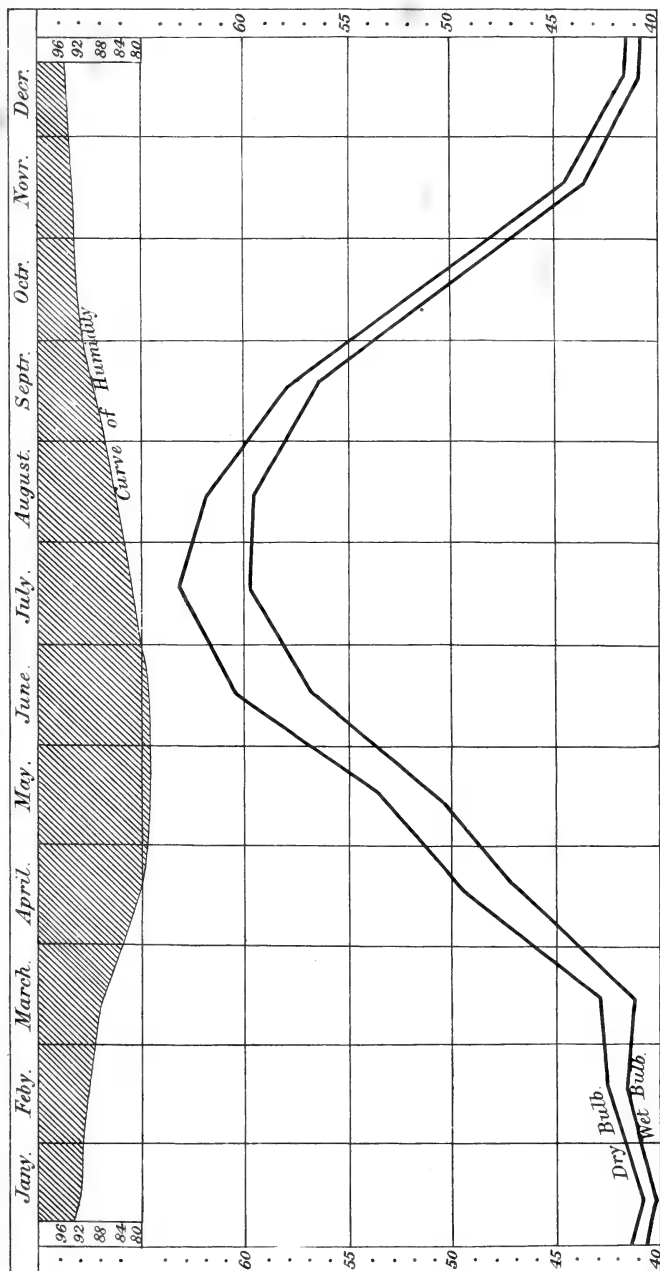
Another property of air is worth noticing. It may be shown thus: If we mix equal quantities of air fully saturated at different temperatures, some part of the vapour will be precipitated in the form of water. Take, for example, a cubic foot of air at 70° F., and mix with a cubic foot at 32° F., both being fully saturated; the result is, 2 cubic feet at a temperature of their arithmetic mean; *i.e.* at 51° F. But in the process we shall also have mixed 8 grains + 2.1 grains of vapour as well. To an ordinary observer it would seem no other effect would follow; but the property of air I alluded to above is that air at 51° F. can contain only 4.2 grains of aqueous vapour in a cubic foot; and hence our two cubic feet can contain only 8.4 grains of vapour. We have thus $10.1 - 8.4 = 1.7$ grains more vapour of water than the air can hold, and hence it must be precipitated, and so we get rain.

What I have now shown on a small scale applies equally to large bodies of air; and if such temperatures as I have taken should actually occur, we get $8\frac{1}{2}$ grains of water precipitated for

every 10 cubic feet of the atmosphere, and in this room the quantity would weigh more than 3 lbs., and measure more than $1\frac{1}{4}$ quart. Hence, when we take into consideration the millions of cubic miles the air fills, we can understand where the thousands of tons of water which fall during a rainy day are stored, and also how precipitation takes place. In Plymouth the hot Return Trades come to us laden with vapour, and on mixing with the cold air over the land a first precipitation ensues. Then, as the air still containing a part of its vapour ascends the hills of Dartmoor, a portion of the pressure from the superincumbent air is taken off, and the air expands; but in so doing it must get heat from some place, and as it can derive it from no other source, it draws on itself for the supply, and thus cold is produced. Hence hillsides exposed to prevailing equatorial winds are always the localities of great rainfall; see Sleathwaite, in Cumberland; and the Western Ghauts, in India. I say *hillsides*, because if the hills be high the tops are frequently above the rain-bearing clouds, and then less rain would fall on the summit of the hill than on its sides. Very frequently, at 8 a.m., and even throughout the day, I find my wet and dry bulbs indicating the same temperature, thus showing the atmosphere to be completely saturated; and occasionally I have seen the wet bulb as much as $\frac{3}{4}^{\circ}$ above the dry bulb, but this has been only after and during warm, drizzling, foggy weather. On June 22nd, 1865, and May 20th, 1880, I found 15° between the readings of the bulbs with relative humidities of 41 and 48.6. These are the least humidities I have observed in Plymouth, and each was after several days of continuous easterly winds. In June I find, as a rule, the least relative humidity, and in November the greatest.

My rain gauge is by Casella, of the Snowdon pattern; is 8 inches in diameter, and placed on my office, before referred to, 9 feet 2 inches above the level of the ground, and 75 feet above mean sea level. From its height above the ground I lose from seven to eight per cent. of the rainfall; but what is worse, I am sheltered by trees from east-by-south to south-by-east, which cuts off a very large proportion of any rain which may fall when the wind blows between these points. Towards the north-west there is another house; but as the top makes an angle of less than 40° with the horizontal line through the top of the gauge, I have no fear of losing much rain from that quarter, because, from the Rotherham

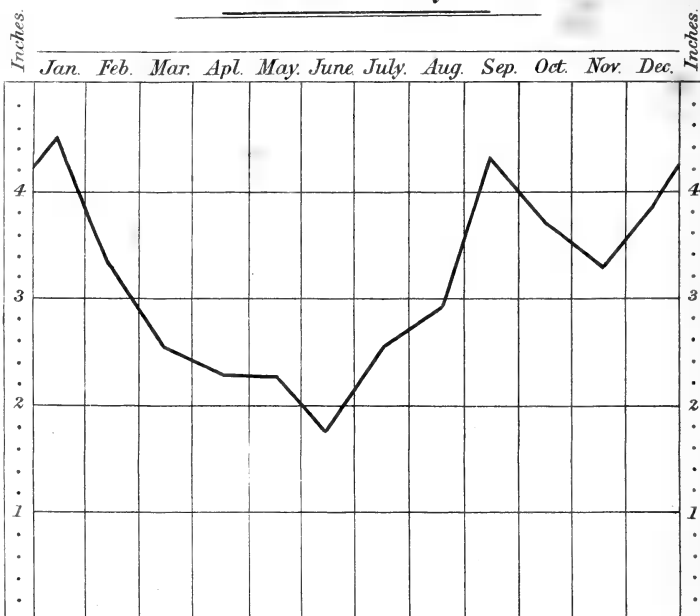
Curve of Mean Monthly Dry and Wet Bulb Thermometers.



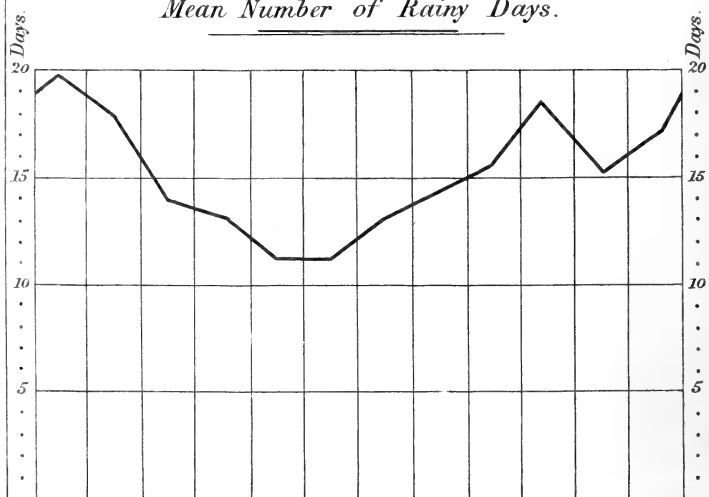




Curve of Mean Monthly Rainfall.



Curve of Mean Number of Rainy Days.



experiments extending over fifty-six months, Mr. Strachan has calculated that the mean inclination of falling rain makes an angle of 42° from the vertical. The rainfall here is very fluctuating, ranging from 45.06 inches in 1872, to 24.10 in 1870, but the average fall is 37 inches, and the number of rainy days 182.8, or nearly 183. I have called a rainy day one when not less than one-hundredth of an inch falls. The months of greatest fall are January and September, and those of least fall are June and May.

Seasons.	Months.	Rainy Days.	Rainfall.	Rainy Days in Seasons.	Rainfall in Seasons.	Percentage Rainy Days.	Percentage Rainfall.
			Inches.				
Spring	March	14.08	2.532	38.65	7.084	7.70	6.84
	April	13.19	2.303			7.22	6.22
	May	11.38	2.249			6.23	6.08
Summer	June	11.50	1.769	39.25	7.173	6.29	4.78
	July	13.25	2.508			7.25	6.78
	August	14.50	2.896			7.93	7.83
Autumn	September	15.63	4.223	49.44	11.136	8.55	11.41
	October	18.44	3.669			10.09	9.92
	November	15.37	3.244			8.41	8.77
Winter	December	17.81	3.816	55.44	11.608	9.74	10.31
	January	19.69	4.481			10.77	12.11
	February	17.94	3.311			9.82	8.95
		182.78	37.001			100.00	100.00

The six summer months from March to August have 77.90 rainy days, and a rainfall of 14.257 inches, which gives 42.62 per cent. of rainy days, and 38.53 per cent. of the rainfall.

The six winter months from September to February have 104.88 rainy days, and a rainfall of 22.744 inches; this gives 57.38 per cent. of the rainy days, and 61.47 per cent. of the rainfall of the year.

We sometimes, though rarely, experience heavy rains. Taking the past twelve years, 1869 to 1880 inclusive, we have had on the average a rainfall of half an inch, or above, three times in two months; a rainfall of three-quarters of an inch about once every three months; and an excessive daily rainfall, or one exceeding an inch, about five times in two years. On one occasion only have I measured more than two inches (2.15); viz., in the twenty-four

hours of January 1st, 1875.* It may convey a better idea of what I mean when I speak of an inch of rain, if I state that it means 22·687½ gallons, or 101½ tons of water per acre; *i.e.* nearly 65,000 tons of water precipitated on every square mile of surface; or, again, one inch of rain means more than 5 lbs. 3 oz. on every square foot of surface on which the rain falls; and therefore in a room of the size in which we now are, an inch of rain would measure 567 gallons, that is, more than 10½ hogsheads, and weigh 2 tons 10½ cwt.

I have already spoken of the sheltered position of my gauge, and to get as nearly correct returns as lay in my power I have consulted other observations made in the town, and find that in the ten years from 1869 to 1878, both inclusive, Mr. Balkwill, on the top of his house in Old Town Street, collected 412·05 inches against 363·19 collected in my gauge; he thus showed a rainfall of 13·45 per cent. greater than I did. The elevation of his gauge (35 feet) above the street necessarily gave him too little. I then took the five years from 1870 to 1874, and found that at Drake's reservoir Mr. Bellamy collected 201·43 inches, against 196·94 by Mr. Balkwill, and 171·09 by myself. Thus it would seem my returns should be increased by 17·73 per cent., or about by one-sixth for rainfall, and the number of rainy days by 3·47 per cent.,

* We subjoin a table of all rainfalls greater than an inch for the last decade:—

	inches		inches
February 7, 1870 . . .	1·31	September 17, 1875 . . .	1·21
May 12, 1870 . . .	1·16	September 21, 1875 . . .	1·21
July 10, 1870 . . .	1·20	October 18, 1875 . . .	1·02
July 29, 1871 . . .	1·04	October 26, 1875 . . .	1·46
August 17, 1871 . . .	1·00	August 4, 1876 . . .	1·03
June 18, 1872 . . .	1·04	September 29, 1876 . . .	1·00
July 6, 1872 . . .	1·35	December 26, 1876 . . .	1·22
January 26, 1873 . . .	1·13	April 15, 1877 . . .	1·45
July 25, 1873 . . .	1·46	August 26, 1877 . . .	1·07
November 5, 1873 . . .	1·16	January 2, 1879 . . .	1·17
January 8, 1874 . . .	1·07	June 30, 1879 . . .	1·35
September 3, 1874 . . .	1·27	August 19, 1879 . . .	1·60
September 30, 1874 . . .	1·12	September 18, 1879 . . .	1·28
January 1, 1875 . . .	2·15	October 25, 1879 . . .	1·22
July 14, 1875 . . .	1·91	July 25, 1880 . . .	1·06

It would thus appear we may expect a rainfall of an inch or more five times in two years.

or by about one-thirtieth. This would give 43·561 inches as the correct average rainfall, and 189·12 as the average number of rainy days for Plymouth. The humidity of a district should be judged more by the number of rainy days than by the quantity of rain which falls; because fine rain falling for several consecutive days not amounting to nearly as much as a single short heavy shower, will render a climate more moist than another where rain falls heavily for short periods; and in Plymouth we often get drizzling rain lasting for hours, or perhaps for days, and yet the rainfall for that time is comparatively small. Although so near the sea, and situate, as I have said, in the path of the Counter Trades, we sometimes, though rarely, experience a want of rain. From March 18th to July 2nd, 1870, if we omit a thunder-shower on the 12th May, only 1·3 inch of rain fell in 106 days; but on the average we have rain enough to measure, that is, amounting to ·01 inch, every other day, to the amount of less than one-twentieth of an inch on 59 days in the year, and to the amount of less than one-tenth of an inch 88 days in the year. In the past five years there have been twenty-four weeks (from Sunday to Saturday) in which I have collected no rain. It happens in Plymouth that the month of greatest rainfall, $4\frac{1}{2}$ inches, in January, corresponds with the greatest number of rainy days, viz., $19\frac{2}{3}$; but the month of least rainfall, June, $1\frac{3}{4}$ inch, does not correspond with the least number of rainy days. September stands fifth in order of rainy days, but is second in order of rainfall; hence, if we neglect summer thunder-showers, our heaviest rains must occur in that month.

WINDS.—Again we must enlist the Counter Trades into our service to explain the prevalence of south-westerly winds in Plymouth, and on all western seaboard in the North Temperate Zone; but from our sheltered position we do not feel the full force of the wind from any direction. During the sixteen complete years I have kept a meteorological register in Plymouth, on 1252 mornings the wind was from north-by-east to east, 1032 mornings from east-by-south to south, 1700 mornings from south-by-west to west, 1348 mornings from west-by-north to north, whilst on 512 mornings there have been calms. These numbers give 21·42 per cent. from the north-east quadrant, 17·66 per cent. from the south-east quadrant, 29·09 per cent. from the south-west quadrant, 23·07 per

cent. from the north-west quadrant, and 8·76 per cent. calms. The winds with a westerly tendency in them were 52·16 per cent., and those with an easterly tendency were 39·08; this gives four days of westerly winds to three days easterly ones. The strongest winds begin to blow from south-south-east to south, increasing in violence as they veer, the extreme being reached when about west-south-west, and gradually dying away as they approach north-west. This phenomena I have explained in a former paper, by showing that the centres of nearly all cyclones pass us to the northward; but when it happens that the centre passes us to the southward the greatest violence is experienced from the south-east. This was the case in the celebrated Torbay gale, on 11th January, 1866, when seventy-five vessels were lost in Torbay alone, and about four hundred became total wrecks on our coasts.

THUNDER-STORMS.—Atmospheric electricity is derived from several sources. Among them we may mention friction, evaporation, growing vegetation, and combustion. Every known substance will produce electricity by friction, and can be classified in order of power to produce that energy. It has been shown over and over again that substances of precisely the same kind and temperature when rubbed together cause no electrical action; but only produce a molecular change by heating one portion and cooling the other; then friction will at once evolve electricity. Air charged with moisture rubbing against dry air, Sir William Armstrong has proved, produces the energy spoken of; and much more is produced when the air is agitated, as in winds, and rubbed against the ground and against foliage. In experimental electricity friction of unlike substances is generally resorted to for the production of that force, as of glass against the amalgam laid on the rubber; so water, as in running rivers and on our sea shores from the action of the tides or storms, is constantly agitated, and hence, by the friction thus produced, a great quantity of electricity is evolved. The second source I have chosen is evaporation. Pouillet showed that evaporation from chemically pure water gave to the vapour arising from it no electricity; but if he dissolved either alkalies or salts in the water, the vapour gave positive electricity; and if acid were added instead, then negative electricity was given off with the vapour, the vessel which contained the water in either case becoming charged with electricity of an opposite character. Now all the

water on the earth in its natural state is chemically impure, and contains salts of various kinds dissolved in it; hence the vapour arising from evaporation over the surface of the earth must be always charged positively. The question then arises, How do we find clouds sometimes positively and at other times negatively charged? The former is already accounted for, and we never find clouds negatively charged except during the prevalence of dense mists and fogs. The explanation is then obvious. The vesicles of water composing the fog are good conductors (so good that only those who have attempted to work an electrical machine in a damp atmosphere really know), and take the negative electricity from the ground; when the fog lifts it forms a cloud negatively charged. Thirdly, the chemical changes occurring in that complex product called life always produce positive electricity; and when we consider the millions of growing organisms, both animal and vegetable, who can doubt that these must prove a fertile source of atmospherical electricity? The last source I shall mention is combustion, involving two of the former sources; viz., friction of the unburnt carbon and heated air as they ascend against the surrounding atmosphere, and the chemical changes involved in the formation of vapour of water from the hydrogen, and also of different gases from the hydro-carbons of the fuel. Hence, perhaps, the frequency and severity of the thunderstorms in large towns and in the Black Country. Thunder clouds are recognized by their peculiarly dense and black appearance; they have been observed at all heights, varying from 25,700 feet to not higher than 89 feet above the earth's surface. The discharge of the electric fluid called lightning (which, by the way, has been recently proved to occupy only the one-millionth part of a second) is generally accompanied by a peculiar smell, which was formerly described as sulphurous, but now is known to be produced by ozone. At Stutgard it was found that rain and snow were sometimes positively and at other times negatively charged. Out of 150 observations of the former the rain-drops were found to contain positive electricity in 71 cases, and negative in 79; whilst out of 30 observations on snow, 24 cases were positive, and only 6 negative, the process of crystallization no doubt conducing to the increased proportion of positive electricity in snow. Volta further showed that when the sky was free from clouds the air was always positively charged and the ground negatively, and that no atmospheric electricity could be discovered in

any covered space ; as, for example, in a room, no matter how high the ceiling, nor in a wood. Becquerel proved by ascending Mount St. Bernard that the electricity in the air increased with the height ascended. Atmospheric electricity has been shown by different observers to be greater in quantity in January, and least in June, whilst the tension is greater during mists and fogs than when clear. Plymouth appears to enjoy an immunity from electrical storms, thunder and lightning being but seldom known. Thus whilst electricity may be largely generated on our coasts, especially from the friction and evaporation already spoken of, and the sky often shows tokens of the existence of such large quantities of the fluid, yet it is generally carried inland before a violent discharge takes place ; and as thunder is seldom, if ever, heard more than fourteen miles off, so the storm passes unheeded. I have no doubt that a large quantity is silently discharged, through our damp atmosphere, and unperceived by us. This I shall show directly is a very fruitful source of ozone. Our heaviest rains are those known as thunder showers. One of the heaviest I have any record of was on 29th July, 1871, between 9.30 and 10 a.m., when in less than half-an-hour three-quarters of an inch was registered in my gauge. These heavy rains during thunder-storms I can account for only by supposing the vesicles of water forming a cloud to become receivers, and as they are charged with electricity of the same polarity (positive, as a rule), they are kept asunder by electrical repulsion, just as pith balls are when charged with the same kind of electricity ; but when the discharge takes place these vesicles rush together, coalescing to form large drops, and heavy rain is the result.

OZONE.—We come now to a constituent of the atmosphere which, though small in quantity, yet plays a most important part in the economy of nature. I spoke just now of the peculiar sulphurous odour which follows a thunderstorm, and those who have worked with a frictional electrical machine may have noticed the same smell intensified when the machine is worked. That smell is produced by a substance called ozone, so named by Professor Schönbein, of Basle, in 1840, from $\delta\zeta\omega$ = I smell. This substance has been proved to be oxygen in an allotropic condition, and in a peculiarly active state. By direct experiment described in the *Philosophical Transactions* for 1856, Dr. Andrews

concluded that ozone was oxygen condensed to one-half its volume; but Professor Roscoe says it is condensed in the proportion of 3 to 2, and can be reconverted into ordinary oxygen gas again by the application of great heat. Professor Tyndall in his researches on radiant heat (*Mode of Motion*, p. 339) showed that ozone must be atoms of oxygen packed in swinging groups; *i.e.* forming molecules, not atoms; and it is now generally accepted that three atoms of oxygen go to form a molecule of ozone. It is characterized by its high oxydizing powers, and it readily decomposes most organic compounds as well as iodide of potassium, turning the potassium into potash, and liberating the iodine. This property has been seized on for the purpose of making ozonometers; for starch when acted on by free iodine gives a very characteristic blue colour, light or deep, according to the amount of iodine liberated. Hence paper soaked in starch which has been wetted with a solution of iodide of potassium is the ozonometer generally in use, the paper after exposure being compared with a standard set of colours settled on. I have kept no record of the presence of ozone in Plymouth, because the true amount cannot yet be determined by any known process easy of application; and hence what are called ozonometers should rather be called ozonoscopes, as they show only the probable presence of ozone, and not the amount in the atmosphere. The causes for this are as follows:

(1) There is no method which can be introduced into general use for regulating the quantity of air which passes over the papers, and yet give free exposure; and if we cannot determine the quantity of air which has given the colour, it is certain we cannot estimate the amount of ozone in the atmosphere.

(2) Other substances in the air, especially the trioxide of nitrogen, produce a similar reaction on the test papers, so that we are not sure that any discolouration which may take place is due entirely to the presence of ozone.

(3) No discolouration takes place if the test papers be quite dry, and it is owing to the hygroscopic nature of the papers that any change of colour is visible in them. Hence when the air is moist we get better returns than when it is dry.

Still for comparisons at the same place observations by means of ozonoscopes may be useful. From its great oxydizing powers this forms, from a health point of view, one of the most useful ingredients our atmosphere contains; all disease germs are at once

burnt up by contact with it. Hence places containing much ozone are considered healthful. The quantity in air is always very small, rarely more than 1 in every 700,000; but it is always found in greater abundance in the open country than in crowded towns, and in still greater quantities on sea-shores. This may be accounted for from the fact that in densely-populated districts the ozone is quickly used up in the oxydizing process always going on in organic substances which are largely produced in towns; and we also know that electricity is one great source from which ozone is derived.

I have just stated that friction between unlike substances and evaporation are two of the causes which produce atmospheric electricity; and we in the south-west district have practically an unlimited supply from the daily rise and fall of the tides, the occasional storms, and evaporation from the surface of the whole North Atlantic Ocean. It is also known that ozone is produced in far larger quantities where electricity is discharged continuously and silently through an atmosphere containing oxygen than where electric discharges take place in long flashes, and therefore more ozone is produced here than where thunder-storms are more prevalent.

One other circumstance should not be forgotten when speaking of the climate of a place. It is this: Sea water holds in solution from one-thirtieth to one-fortieth of its volume of air; but there is this difference, whilst the atmosphere contains only about 21 per cent. of oxygen, the air in sea water contains 32 per cent., or more than half as much more. By agitation we may reasonably suppose a portion of the air surcharged with oxygen is given off, and during storms the quantity is very likely much increased, and the effects on health highly beneficial. This I take is one of the chief reasons why a seaside residence is so conducive to improved health among invalids. Now in Plymouth, in common with the whole south-western district, we have the broad, deep, stormy Atlantic as the storehouse whence we draw our supply of this element; whilst on the east coast the storehouse is narrowed down into the comparatively shallow, calm North Sea, or German Ocean.

I have endeavoured to obtain information to draw comparisons between our town and some health resorts in the south of our island; but as I was unable to get the results for the same periods

as I have kept observations, I was obliged to compare the same years with each place mentioned in the table. Then, assuming there would be the same proportional difference between the years I was able to procure and the sixteen years at the place, as there was between the same years and the sixteen years at Plymouth, I have constructed the table reduced to sixteen years' average. Let me explain myself. For Brighton I obtained the returns for twelve years, from 1868 to 1879. I then averaged my observations for the same twelve years; and I assumed that the average for sixteen years at Brighton would bear the same proportion to the twelve years I had procured, as the average of sixteen years' observations at Plymouth bore to the same twelve years here; and it is on this principle the table is calculated.

A COMPARISON OF METEOROLOGICAL PHENOMENA REDUCED TO SIXTEEN YEARS' AVERAGE.

PLACES.	TEMPERATURE.			RAINFALL.		DURATION OF OBSERVATIONS.	OBSERVER'S NAME.
	Average Maximum.	Average Minimum.	Annual Average.	Annual Number Rainy Days.	Annual Average in inches.		
PENZANCE .	55·99	47·93	51·96	45·03	15 years, 1865 to 1879.	W. Hoskin Richards.
TRURO *	58·48	45·09	51·79	196	41·04	25 years, 1850 to 1874.	Dr. Barham.
PLYMOUTH .	58·18	45·05	51·62	189·12	43·56	16 years, 1865 to 1880.	J. Merrifield.
TORQUAY .	57·28	44·55	50·92	185·81	39·40	4 years, 1877 to 1880.	E. E. Glyde.
TEIGNMOUTH	58·80	44·71	51·75	179·09	36·52	6 years, 1874 to 1880.	Dr. Lake.
BRIGHTON .	56·38	44·07	50·22	162·86	29·01	12 years, 1868 to 1879.	F. E. Sawyer.

* The whole twenty-five years' averages are inserted for Truro.

For Penzance and Torquay I have been enabled to enter more fully than for the other places, and the results I have deduced are as follows:

For Penzance.—The summer heat of July and August is $3\frac{1}{2}^{\circ}$ less

than at Plymouth; the winter cold of December, $4\frac{1}{2}^{\circ}$, and of January, $3\frac{1}{2}^{\circ}$, less than at Plymouth. The winter range is but $5\frac{1}{2}^{\circ}$, whilst at Plymouth it is 10° ; the summer range is 10° , against $15\cdot7^{\circ}$ at Plymouth; but the average annual temperature is almost the same. The rainfall at Penzance is greater; the number of rainy days I have not been able to compare. Hence, I deduce that the climate there is much more equable than that we enjoy, and is therefore better for invalids.

For Torquay.—The summer heat of August is $\frac{3}{4}^{\circ}$ less than at Plymouth, and the winter cold of December $\frac{1}{4}^{\circ}$ greater than at Plymouth. The winter range is precisely the same as at Plymouth, but the summer range is 13° , against our $15\cdot7^{\circ}$. The rainfall is rather less than here, but there are an equal number of rainy days, and the average annual temperature is about $\frac{2}{3}^{\circ}$ less than at Plymouth. Hence, I say, the climates are nearly about the same, and for invalids there is not much difference in which is chosen of the two; but as the returns from Torquay are only for four years, longer observations there may modify my deductions. I have to express my thanks to Mr. Hoskin, at Penzance, and to Mr. Glyde, of Babbacombe, for sending me their records so fully.

In conclusion, I should say the climate of Plymouth is warm and moist, with a great number of rainy days, but not an excessive rainfall. Thunder-storms are very rare; but considering the nature and sources of ozone, we may expect to have a large share of that health-giving element.

AVERAGE OF METEOROLOGICAL OBSERVATIONS FOR SIXTEEN YEARS,
1865 TO 1880 (BOTH INCLUSIVE).

Latitude, 50° 22½' N.; Longitude, 4° 7¼' W.

MONTH.	BAROMETER Reduced to mean sea-level at 32° F.				TEMPERATURE.			HYGROMETER.				RAINFALL.		WINDS. No. of days on which wind blew.				
	Average Barometer.	Maximum Barometer.	Average Barometer.	Minimum Barometer.	Average Maximum in Shade.	Average Minimum.	Average Temperature.	Average Dry Bulb.	Average Wet Bulb.	Average Dew-point.	Average Humidity.	Number of days on which not less than 0.1 inch fell.	Quantity for the month in inches.	From N. by E. to E.	From E. by S. to S.	From S. by W. to W.	From W. by N. to N.	Calms.
January	29.917	30.459	29.047	29.168	47.03	37.65	42.34	41.48	40.55	39.39	93	19.69	4.481	6.10	5.79	11.56	5.29	2.26
February	29.950	30.471	29.168	29.168	48.95	38.92	43.94	42.63	41.67	40.51	92	17.94	3.311	5.13	4.69	10.00	6.06	2.38
March	29.936	30.439	29.248	29.248	50.76	38.30	44.53	42.83	41.18	39.20	87	14.08	2.532	9.31	3.88	7.12	8.75	1.94
April	29.915	30.360	29.225	29.225	57.48	42.66	50.07	49.25	46.96	44.50	84	13.19	2.303	8.40	5.82	7.02	6.37	2.39
May	29.973	30.360	29.488	29.488	61.81	45.84	53.83	53.86	50.74	47.68	79	11.38	2.249	7.63	5.50	7.38	7.13	1.38
June	30.022	30.341	29.531	29.531	67.84	51.75	59.80	60.23	56.70	53.59	79	11.38	1.769	5.00	6.56	8.88	7.81	1.75
July	29.984	30.322	29.570	29.570	70.72	55.22	62.97	62.90	59.65	56.89	80	13.25	2.508	4.12	4.94	10.50	8.75	2.69
August	29.955	30.286	29.518	29.518	69.06	55.03	62.50	61.74	59.28	57.16	85	14.50	2.896	5.67	5.50	9.63	7.62	2.56
September	29.932	30.359	29.403	29.403	65.67	51.76	58.72	57.74	56.12	54.66	89	15.63	4.223	5.56	5.44	9.56	5.38	4.06
October	29.888	30.407	29.263	29.263	58.53	45.99	52.26	51.14	50.03	48.88	92	18.44	3.669	7.06	5.25	8.00	6.94	3.75
November	29.931	30.448	29.141	29.141	51.72	39.92	45.82	44.44	43.38	42.14	93	15.37	3.244	8.00	3.75	8.00	7.50	2.75
December	29.935	30.523	29.155	29.155	47.74	37.52	42.63	41.55	40.68	39.60	93	17.81	3.816	6.18	5.35	8.62	6.68	4.17
Average for 16 years.	29.945	30.398	29.313	29.313	58.18	45.05	51.62	50.82	48.91	46.91	87	182.8	37.00	78.18	64.47	106.27	34.28	32.08

THE FOSSIL TYPE OF MAN IN THE PAST AND PRESENT.

SYLLABUS OF LECTURE BY REV. J. ERSKINE RISK, M.A.

(Read February 24th, 1881.)

THE question stated. Tests of diversity of type. Relation of size and shape of skull, and brain capacity. Argument applied to North American types. Comparison with recently discovered European fossil skulls. Results in the respective opinions of Huxley, Broca, Quatrefages, and Hamy. Bearing of subject on Quatrefages' question of Primitive Barbarism *versus* Civilization. Common traditions and customs of Old and New Worlds. Carved ivory of cave-men, and pictographs of North America. Medicine men and shamans. Bearing of similarity of fossil and North American types on question of origin and age of man. Summary and conclusion.

LOUIS XIV. AND HIS AGE.

SYLLABUS OF LECTURE BY MR. D. SLATER, M.A.

(Read March 3rd, 1881.)

REVIEW of French history to the death of Louis XII. Sketch of the chief countries of Europe at the accession of Louis XIV. Chief events of his reign. His treatment of the Protestants and its effects. Literature of the period. The French Academy. The Hôtel de Rambouillet. Female writers. The Theatre. Poets, philosophers, preachers. History of science and art.

PROFESSIONAL EXPERIENCES.

SYLLABUS OF LECTURE BY MR. J. N. BENNETT.

(Read March 10th, 1811.)

THE paper consisted mainly of the statement of a series of facts, embracing three cases, two of them involving the right to large estates. The first was the strange and eventful history of a gentleman who disappeared from a neighbouring county under circumstances of deep interest, giving rise very long afterwards to a case of disputed identity, which rested entirely on circumstantial evidence. The second showed how, previously to the late reform of the real property laws, a family was disinherited by a legal fiction, in spite of the clearly expressed intention on the part of the husband and father to give them all his property. The third commemorated a professional deliverance of a remarkable nature under critical circumstances.

CRIMINAL RESPONSIBILITY.

SYLLABUS OF LECTURE BY MR. W. SQUARE, F.R.C.S., F.R.G.S.

(Read March 17th, 1881.)

THE present system of judging of Criminal Responsibility is not sufficiently accurate. Four heads to be considered—youth, ignorance, drunkenness, insanity. Youth: The juvenile criminal. His present inadequate treatment. Remedy. Ignorance: The great question of the criminal class generally. The unfairness of courts to the prisoner. The marked jail bird: The difficulties of treating with drunkards. Attempt at explanation. The Insane: The tender and careful examination that is necessary so rarely given. The value of treatment. Conclusion: The difficulties and tremendous responsibilities of judges.

SIR FRANCIS DRAKE AND THE PLYMOUTH CORPORATION.

BY MR. R. N. WORTH, F.G.S.

(Read March 24th, 1881.)

IN the course of some remarks at our last *Conversazione* upon the Corporation portrait of Sir Francis Drake and the presumed portrait of Sir John Hawkins, then exhibited, I expressed my regret that the Receivers' Accounts of the borough of Plymouth for the latter part of the sixteenth and the earlier half of the seventeenth century were missing. Two days later I learnt casually that an ancient MS. volume had just been found among some family papers, which contained references to Drake. Enquiry proved that this was the missing book, and by the courtesy of Mr. W. H. Prance, I was permitted to make a full examination of its contents. This lecture and much newspaper correspondence are the results.

The book is a large folio of over 600 pages, with many thousand entries, comprising the entire record of Corporate receipt and expenditure from the mayoralty of John Martyn (1569-70) to that of William Gefferie (1657-8), both inclusive; and with it the Municipal Accounts are practically complete from the year 1486 to the present time—a period of just four centuries. The volume was found at Widey Court, the seat of the Morshead family, in the course of removing the family muniments, and its true character was not suspected until it was seen by me. How it found its way to Widey it is impossible to say. There is no evidence that it has been in the possession of the Corporation since the 17th June, 1679, when it was shown in evidence—as noted therein—in a suit then pending between them and Richard Strode. Probably, however, it remained with the Corporation* until one of the two

* It seems to have been used by Edward Deeble, Mayor 1718-19, 1727-8, 1739-40, who compiled a local record.

mayoralties of John Morshead, 1753-4 and 1762-3, and then, being removed for some purpose, was by accident omitted to be returned.* That it is by far the most valuable volume of our Municipal Accounts, the new light thrown upon the relations of Sir Francis Drake and the Corporation, and the history of the Plymouth Leat, is but one proof of several that might be adduced.

The character of these ancient Corporate Accounts should be explained. The Treasurer of the borough was formerly an annually appointed officer called a Receiver, and in the usual course of events in due time became Mayor. By him all moneys were received and paid, and he accounted for his proceedings at an annual audit in November, when the items were entered up by the Town Clerk, and the entries certified by four auditors—two aldermen and two councillors—who signed the book in witness of their accuracy. The most trifling details, if they stood alone, found separate record; but if a bill was brought up, it was the practice to enter only the total, and to state that the particulars had been seen. In all matters which were the subject of receipt or payment these accounts give therefore an exact reflection of the Corporate and social life of ancient Plymouth; they are moreover the most valuable kind of documentary evidence, testifying not to mere opinion, but to acts done under official direction, and receiveable as evidence in any competent court of law.

Those who have done me the honour to read my *History of Plymouth* will remember that while I speak in somewhat guarded language of the history of the Plymouth Water Supply, and deny that Sir Francis Drake in a pecuniary sense *gave* the water, I accept the current idea that he was the author and engineer of the undertaking. Great therefore was my surprise when I found by entry after entry in this volume that the sole credit of the work was due to the Corporation; that their surveyor, one Robert Lampen, was the engineer, and that the part which Drake played was simply that of the paid agent or contractor, by whom the operations were not initiated but completed. Having ascertained these facts for myself, it seemed right to me they should be known to others. My idea of the duty of a student of history is that he should be ever ready

* It has been presented by the Rev. J. Morshead to the Corporation through Mr. Prance, and is thus restored to its place among the Corporate Muniments.

to receive and appraise fresh evidence; that the search for truth, and not adherence to any set of views, should be his motive. Having, like others, been led into error by the absence of full testimony, but having, unlike others, been fortunate enough to light upon the real facts, I had no choice but to place the public, so far as possible, in the same position of advantage as myself.*

In laying before this Institution, in compliance with request, the true history of the origin of the Plymouth Water Supply, I intend in the first place to let the Accounts of the Corporation tell their own tale, quoting every relevant entry, and giving the *ipsissima verba* of every reference; and then to enquire what is the tenor and weight of exterior contemporary witness and of tradition. If there is any value in the official records, the conclusion will then be clear. If, however, this book, with its 600 pages and 18,000 or 20,000 entries, is deemed a modern forgery, or if it is held that successive corporations made false entries at intervals over half a century, with the purpose of defrauding Drake's fair fame three centuries after he had died, matters will of course remain *in statu quo*. Such suggestions have been made.

There is some indication of the chief sources of the water supply of the inhabitants in the early days of Plymouth in yet extant names of streets and places: Buckwell, Finewell, Ladywell, and Westwell, while there are old entries of Quarrywell, and of a hermitage thereat. All these names indicate the locality of wells more or less of a public character. Martock's Well, *temp.* Henry VIII., possibly may have been private.

The earliest entry of any Corporate expenditure in reference to water with which I am acquainted is under the mayoralty of William Nycoll (1495-6).

Itm p^d for mendyng of a Cunditt yⁿ the tenemente
some tyme Nicolas Elsworthy y^s xvij^d

So in 1502-3 a common conduit was mended in "Seynt Andrewystrete;" and in 1509-10 we have work done in John Paynter's close "for the conveyance of the wat^r yn to the way." About these and similar entries there may at times be a doubt as to the exact sense in which the term conduit is used; but there can

* For every statement made in this paper the original authority is given.

be none with regard to the references to pumps, as for instance when we read in the mayoralty of William Weekes (1549-50):

Itm paid for plats of Ire to amend the boxe of the
plumpe of the well of the south syde and for
Arnold Rawlyns labour abowte the same iiij^s iiij^d

There are many subsequent entries of repairs to this said "plumpe," which was undoubtedly used for the supply of ship-ping.

I will not undertake positively to say whether the following entry refers to water supply or not; but it is not improbable, and is deserving of record:—

Itm payed for the Gotters of Clome that m^r howe
bought xxv^s

This was the Howe who founded the charity which bore his name, but which has long since disappeared.

The first entry which records that the local supply of water was insufficient, and that steps were taken to provide for the deficiency, is dated 1559-60, in the mayoralty of Lucas Cock:—

Itm to M^r forsland of boy & his company for
vewinge of the ground wherebie freshe water
myght have byn brought unto the towne xvj^s x^d

This is a very important statement. It shows that twenty-five years before the date of the ~~Water Act~~ the Corporation had this matter of an exterior water supply in hand; and though, from circumstances which we cannot fully trace, several years passed before anything more was done in this direction, it is clear that the initiative was taken by the Mayor and Commonalty. It would be idle to suggest that Drake was then concerned—an unknown sailor in his twenty-first year.

We have fortunately evidence who this "Mr. Forsland" was, for whom the Corporation sent all the way to Bovey. He was a man of note in his way, and one of the best men for the purpose that could have been selected. He was a "tin streamer," a member of the Stannary Parliament that assembled at Crockern Tor in 1576, and was in its records described as "gentleman." Tin streamers were accustomed, in the course of their occupation, to make leats for the conveyance of streams of water, and hence Forsland was

thoroughly familiar with the work in hand. Nothing came of his visit except the payment aforesaid, which, like the other payments quoted, may be reckoned at five or six times the amount stated in present value. The wages of a working tinner or "spader" were then but 2s. a week, so that the 16s. 10d. was by no means an unreasonable fee even for Forsland and his men.

It has been doubted whether any class of labourers was paid so low as this in the reign of Elizabeth; but the evidence is conclusive. In the Corporation Accounts I find such notes as these:—1591–2. Six days pay to two men that served the paver, 4s. 4d., *i.e.* 2s. 2d. each per week; three labouring men six days, 12s., *i.e.* 4s. per week; four labourers five days, 13s. 4d., *i.e.* also 4s. per week. In the next year masons were paid 9d. each per day, while in 1596–7 a carpenter had 1s. 1d.* Four shillings is the highest figure specified for ordinary labourers in the town. In the country the rate was then, as now, much lower. Sir Walter Raleigh, in a speech in Parliament in 1601, claimed that his exercise of the pre-emption of tin had increased the pay of the working tinner from 2s. to 4s. Cock's MS. (1586) puts the wages of the hired tinner at £3 a year, or 2d. a day, out of which the poor labourer had to find himself. So too Beare in *The Bailiff of Blackmore*.†

Westcote,‡ writing some forty years later, says that no labourer in hard work or hardship equalled the spader or tinner, "bread the coarsest; cheese the hardest; drink the thinnest;" and Risdon,§ repeating and confirming this, says, "his apparel is coarse, his diet slender, his lodging hard, his drink water, and for lack of a cup he commonly drinketh out of his spade or shovel, or some such thing."

We have no direct information whither Forsland went; but it was evidently beyond the immediate outskirts of the town. Taking the topography of the district into account, I do not see where he could well have gone, if not to the Meavy, but that is merely an inference upon which I desire to lay no stress. Nothing then came of his work beyond the payment; but it was undoubtedly the first

* In 1506–7 2d. a day was paid for labour, while masons had 4d.; yet in 1511–12 masons' labourers had 6d. a day, because it was harvest-time. In 1521 a carpenter had 7d. a day.

† British Museum Additional MSS. 6713, copied by Hoblyn.

‡ "View," p. 53.

§ "Survey," p. 11, ed. 1811.

step towards bringing in a distant water supply; though the Water Act was not founded eventually on his survey.

It is not, however, to be understood that the Corporation remained content with things as they were until the Water Act was obtained. On the contrary, there is plain proof that they did what they could to utilize local sources. The "plumpe" at the Southside came so frequently to repair that it must have been much in use. In 1571-2 a New Conduit is mentioned, said to be built by William Hawkins, and apparently associated in some way with the Market Cross, which stood in Old Town near the intersection of Treville Street. A town well and pump are also frequently referred to; and a pump in Hawe Lane; while in 1583-4 (John Sparke, mayor) we have a couple of entries which show that the conduit was supplied by a stream of some kind:—

Itm pd to Wilstrewe for bringinge the water above grounde
to the Conditt v^s

Eighteenpence was also paid for mending the conduit pipe. There was a stream in what was afterwards called Shute Park—a name of itself sufficiently descriptive, on part of which the Free School now stands.

But this has carried us somewhat in advance. We go back therefore to the mayoralty of John Ilcombe (1576-7), and there we read—

Itm pd to certayne men that vewed the River at the
requeste of m^r mayo^r & his brethren for their
paynes & for their charges aboute the same lijs v^d

This entry is still more definite than that relating to Forsland. Again the Corporation seek advice about their water supply. The work is undertaken by "Mr. Mayor and his brethren," and "the River" is mentioned as the source in view. Again, however, nothing more is done. The Corporate Accounts show that there were no large funds in hand; indeed it was with difficulty the receipts and expenditure could be brought to balance.

It is not unimportant to notice that it was in November, 1577, that Drake sailed on his famous voyage of circumnavigation; and that for several months preceding his departure he had his hands full of quite other matters than planning a water supply, even if the official entry did not preclude the idea. The chief importance

of the reference is in the complete answer it gives to a suggestion that Drake got a hint for the Plymouth Leat in this voyage from the Peruvian aqueducts. It equally disposes of the idea that Drake originated the scheme in his mayoralty—1581–2. Nay more, we have here full proof that there was a water scheme already in existence, which during Drake's mayoralty no steps were taken to further,—and not only *a* scheme, but *the* scheme which the Corporation subsequently carried out. The Meavy was the only local "river," then as now, from which a gravitation supply could be brought.

It is a remarkable fact that a man of so much energy as Drake should have had one of the most unimportant mayoralties of that generation. Only two municipal acts have been definitely attributed to him in his year of office, and these he certainly did not do. He has been credited with having caused the aldermen to wear scarlet gowns; but the bye-law to that effect was made several years before. To him has also been attributed the expenditure of some of his "Spanish prize money" in the erection of the "compass on the Hoe." The following entry in the Corporation Accounts will show whence the money really came :

Itm p^d for all the charges in makinge the compasse
as by a Bill mentioninge the pticulars thereof
shewed at this accompt appeareth vj^{li} xvijs^s ij^d

Drake's only connection with the "compass" is in fact its erection in his mayoralty. It has been imagined, indeed, that if Drake did not pay for the compass he planned or suggested it. But the Accounts forbid the supposition. The compass of 1581–2 simply replaced one erected in 1569–70, and plastered in the next year; and the entries show that this hitherto mysterious structure, which has excited so much speculation, was a mere landmark of masonry surmounted by a vane, intended to show the cardinal points and which way the wind blew—very useful, but not in anywise marvellous.

There are no further entries about the water until we come to the Water Act. This statute was applied for and obtained in the mayoralty of Christopher Brooking, 1584–5. Towards the close of 1584 Elizabeth called a new Parliament—the first since 1572—and advantage was at once taken by the Corporation to fortify

themselves with legal powers to carry out their scheme.* The burgesses for Plymouth were Christopher Harris, of Radford, and Henry Bromley; and intimation was conveyed of their being chosen to Drake and John Hele, then "town counsel" (afterwards Recorder), who were both in London:—

Itm paide to a man to goe to London wth L^{res} to
S^r Frauncis Drake & Mr. Hele touchinge o^r
Burgesses for the Parliamente xxiiij^s

This sending of special messengers on important errands in pre-Post Office days was a matter of frequent occurrence, and the occasion is often, as in this instance, specified. (There is one entry of the payment of 5s. for sending letters into Spain!) The Parliament met† on the 23rd November, 1584, and sat until December 21st, when it adjourned until February 4th. It was finally dissolved by the Queen in person in the March following. Here are the entries of the Corporate expenditure upon the Act:—

Itm paide to Mr. Hele for his helpe att London
for furtherenge of o^r sute for bringinge in
of the water as by his bill appeareth. . . ix^{li} j^s vj^d
Itm paide to Mr. Christopher Harris for the helpe
about the water as by his Bille appeareth. . xvij^{li} vj^s
Itm paide to George Baron for his paines and
charge in sollicitinge the Cawse for the
Bringinge home of the water to the Towne
w^{ch} is enacted spendinge xxviiij daies . . viij^{li}
Itm paide more for drawinge of the Acte manye
tymes writen‡ iij^{li}

These were the charges of expenditure in London, and show beyond all cavil that the Corporation not only prosecuted their own suit, but paid for its prosecution, and sent their Town Clerk—Baron—specially to London to "sollicit the cawse." There is neither mention of Drake, nor room, nor need, for his interference. The means assigned are ample for the end attained.

It will be observed that while Hele is paide for "*his* helpe,"

* May not the delay in the water scheme have been partly caused by the need of procuring parliamentary powers? Much has been said of the influence which, altogether against evidence, Drake has been supposed to have exerted in obtaining the Water Act. Would not his influence, if exerted, have prevented the necessity for such an Act at all?

† Froude's "History."

‡ It was evidently not printed.

Harris is paid for "*the helpe*," and that his expenditure is just double Hele's. In what way the money was applied by Harris an entry of 1509-10 may enable us to judge:—

It deluryd to John Bryan for harry Strete and hym
beyng burges of plement for the towne for ther
labo^r and Expences durynge the plement and for
rewards and pleasurs gyven to dyus lords of the
Courte to be fryndely to the towne . . . x^{li}

It has been suggested, since it was shown that the cost was defrayed by the Corporation, that the Act was obtained by Drake's influence. The wording of these entries shows that the influence used had to be sought in some other quarter. In the absence of direct evidence to such effect I decline to believe that Drake sold his influence; while if he had exercised any to advantage surely the Corporation should have obtained the Act more cheaply.

But Drake was by no means the only man of influence connected with the Corporation. There were others who were equally competent to urge a suit at Court with himself. Thus when the town fortified Drake's Island, at its own expense,* and was assigned a pension of £39 10s. 10d. out of the local customs to maintain it in a defensive position, the patent was obtained by William Hawkins, brother of Sir John—both early patrons of Drake, and to whose influence there is little doubt he owed his admission into the Corporation. The entry runs:—

1579-80—Itm pd to w^m hawkins esquire for money
laied owte in peuryng the patent for the Ilonde
and for his charge in the suyte thereof . . . xxij^{li}

* It would be very curious to trace why and when the island dropped its name of St. Nicholas for that of Drake, who had nothing at any time to do with it, and certainly never raised a battery there, as stated in *Westward Ho!* The fortifying began when Drake was under ten years of age, and was carried on at intervals, but always by the Corporation, aided by the Crown. Thus we read:—

1547-8 Itm geven in Rewarde to the pst w^{ch} brought the Coun-
saylls lres for the fort to be made on saynt Nichos Irlond . . . xij^d

[Work was done on the island this same year under the direction of Sir Francis Fleming; and William Hawkins, John Elyott, John Ilcombe, and Richard Hooper rode to London about the business, and had £2 each.]

1583-4 Itm pd owt this yere in sondrie work,
as in fortefyenge, buyldinge, entrenchinge
and other munytyons boughte for the forti-
ficon of St. Nicholas Island . . . ij lxxix^{li} xiiij^s iiij^d ob

Payments indeed for the exercise of influence are common in the Corporate Accounts, as a few instances will show. In 1503-4 Elford, the town attorney, had 13s. 4d. for his services in London as burgess, and 13s. 4d. more for looking after town affairs there. In 1541-2 a tonne of wine costing £5 6s. 8d. was given to the Lord Admiral to move the King for the discharge of the pension theretofore paid to the Priory of Plympton, which was given up in the same year; and so in 1590-1 :—

Itm given to the old Celye in rewarde for dius Courtesies
and travaile in the townes busynes v^{li}

There were several local items of expenditure on the Water Act. I give the entries, as before, in the order in which they occur :—

Itm paide for a supper for the Justices when they came
to veiwe the course for bringinge the water into
the towne xxxij^s
Itm paide for victualls wine beare and other pvision
carried from hence vpon the Downe . . . v^s vj^d
Itm paide for the hire of three horses att that tyme . ij^s vj^d
Itm paide to a poore man to shewe them the waye . xij^d
Itm paide to Sprie the painter for riding to mevie
aboute the water v^s
Itm paide for his horse hire then xij^d
Itm paide for Mr. Carewes diett when he rode aboute
the water ii^s viij^d
Itm paid to Sprie the painter for makinge of a plot of
the Toune and parrishe wth a Bourder Carried to
the Counsell * x^s

Here then we see not only that the local as well as the metropolitan expenses were defrayed by the Corporation, but that Drake had nothing to do with the “viewing” by the justices, who would not in that case have required “a poor man to show them the way.” The full detail of these entries shows that the Act was really, as it professes to be, promoted by the Corporation, and procured by them at their own expense. It cost them in all £39 17s. 2d., which is equivalent to nearly £250 in the present day, a heavy charge, especially when we find that the Corporate receipts in this very year were but £242 1s. 5d., against an expenditure of £324 2s. 6d.

* Sprie may fairly be called the Corporation artist; his name is of frequent occurrence in the records.

The Act is entitled "An acte for presvacon of the haven of Plymouth," dated the 27th Elizabeth cap. 20 (1585):—

Whereas yo^r Ma^{ties} Towne of Plymouth in the Cowntie of Devon being an auneyent Borough Towne bordering vpon the meane Sea, yet havinge a pleasaunte and safe Harboroughe and Rode for Shippes within or nere the same, comonlie called Plymmowth Haven, wheare as well yo^r Ma^{ties} Shippes as the Shippes and Vessells of dyvers yo^r Highnes Subiects tradinge into forren Partes and from Porte to Porte within this Realme do often vpon necessitie and otherwise arrive harboroughe refreshe and vittell themselves as well wth fresshe water, being a thing very necessarie for them, as with divers other thinges, Hathe, for the moste Parte of the yere, none, or at the leaste verely litle, fresshe water within a myle of the said Towne or thereabowt, a matter verely incomodiouse; By reason whereof yo^r Ma^{ties} Shippes and the Shippes of yo^r Highnes subiects arryving and harbouring in the saide Haven as aforesaide the Marryners of the same are manye and often Tymes dryven by necessytie to goe a Myle or more from the saide Towne and their Shippes to fetch fresshe water for their necessarie vses, by reason whereof dyvers Tymes they loste dyvers good Wyndes and oportuyties whiche they might take benefite of, yf they mighte water them selves nere their shippes; besides the saide Towne being subiect to fyer, as well by the Enemye, for the same was once burned by the Frenche in the tyme of Warre, or by negligence and other mishappe at Home, there is no Water in or nerer the saide Towne for the moste Parte of the yere (especiallie in the Sommer Tyme when the Daungers bee greateste) then a Myle or sometyme more, as the dryeth is, and wheare also the said Haven of Plymouth, being one of the pryncipall Havens and Harboroughes of the West Parts of Englande, doth Daylie querre & fill wth the Sande of the Tynnewoorcks and Mines nere adioyneng to the same, and in shorte Tyme wilbe utterlie decayed yf some Redresse and speedie Remedie be not hadd; and wheare also there is a Water or Ryver within the saide Countie of Devon called the Water or Ryver of Mewe als Mevyne distaunte from the saide Towne abowte Eight or Tenne myles, Parte of the whiche Water or Ryver wth some chardge wilbe brought into the saide Towne of Plymouth without any greate Preiudice or Damage to anye Owner or Owners of any Lande throughe whiche the same shalbe conveyed, By reason (the moste Parte) in effect all the same Lande is either barren and heathie or ells hillye & drye grounds whiche wilbe bettered and amended by the water that shalbe brought throughe the same. By brynging of whiche water moste of the Incomodities and Daungers and divers others shall not onlie be remedied, but also some Parte of the Chanell of the saide Haven scoured & cleansed by the same Ryver to the p^rpetuall contynewance of the same Haven, a matter moaste beneficiall to the Realme.

And wheare also the Inhabitaunts of the same Towne are Incorporated by Kinge Henry the Sixte by the name of the Maio^r and Coialtie of Plymouth whiche is confirmed by yo^r Ma^{tie} and dyuers yo^r noble Progenito^{rs} Kings of this Realme.

Maye it therefore please yo^r moste Excellent Matie of yo^r moaste noble and abundant Grace and accustomed Favoure that yt maye be Inacted by this present Pliament that yt shalbe Lawfull to & for the saide Mayo^r and Coialtie and to their successo^{rs} at all Tymes after the Feaste of Easter nowe next comynge, to digge and myne a Diche or Trenche conteynenge in Bredthe betwene sixe or seaven Foote over in all Places throughe and over all the Lands and Grounds lying betwene the saide Towne of Plymmowth and anye parte of the saide Ryver of Mewe als Mevyne, and to digge, myne, breake, banck and cast vpp, all and all maner of Rockes Stones Gravell Sande and all other Lets in any places or Groundes for the convenyent or necessarie Conveyenge of the same River to the saide Towne, and further from Tyme to Tyme to doe Repacon and make Weares Bancks and all other Things necessarie whereby the saide River may be brought & conteynewe vnto the saide Towne withowte Lette Denyall Vexacon or Trouble of the Lord or Lords Owner or Owners of the same grounde or of any other pson or psons by suyte in the Lawe or otherwise vpon Payne of xx^{li} for everie Tyme that they or anye of them do attempte the Contrarie thereof, the one half thereof to be to o^r saide Sovereigne Ladie and thother halfe to the said Maio^r and Coialtie & their Successo^{rs} to be recovered by Action of Debte, Bill, Pleynt, or Informacon, wherein the ptie Defendant shall not wage his Lawe, nor in the saide Action, Actions, or Suytes anye Essoyne Licence or Protection shalbe allowed, The saide Maio^r and Coialtie gyving and payenge to the Lorde or Lords Owner or Owners of the Soyle where suche Things shalbe made or done, in Recompence and satisfaction of & for the Lande or Grounde so to be digged or myned, for the full & absolute Purchase of the same to them and their Successo^{rs} so moche money as by the twoe Iustices of the Assise of the Countie of Devon for the Tyme being shalbe adiudged ordeyned and determyned And also gyving and payenge to the Tennts Fermo^{rs} and Occupiers of suche Lande or Grounde for suche Hurts or Losses as they or any of them shall have or susteyne by the same, as moche as shalbe assessed adiudged and determyned by the saide two Iustices of Assises, the same Recompence and Satisfaction as well concernynge the Lord or Lords of the Lande as the Tenants Fermo^{rs} and Occupiers of the same to be paid by the saide Maio^r & Coialtie of the saide Boroughe for the tyme beinge or their Successo^{rs} within the space of Sixe Weekes next after the ratinge assessing and determynenge of the same, vnlesse the saide Maio^r & Coialtie & their Successo^{rs} can otherwise compounde and agree wth the Lords Tennts Fermo^{rs} & Occupiers of suche Lande and Grounde or with any of them, and in Case yt happen the Maio^r

and Coialtie of the saide Boroughe to make Defaulte of Payment of the sayde Recompence & satisfaccon and resiste to paye the same as is before reserved, That then the Lorde, Lords, Owner Owners Tenants Fermo^{rs} and Occupiers of suche Lande or Grounde that is agrieved therewth and to whom the Recompence & Satisfaccon ought to be paid shall and maye Lawfullie comence affyrme & take his or theire action of Debte by the course of the Comon Lawe against the Maio^r and Comynaltie of the saide Boroughe for the Tyme being and their Successo^{rs} for recoverie of the same in any Courte of this Realme at the will and Pleasure of the p^{te}ie grieved, and the like Proces therevpon to be hadd, as in accon of debte at the Comon Lawe grounded upon Contract or Specialtie hathe vsed to ben hadd, in whiche no Wager of Lawe Essoyne or Protection shalbe allowed.

Provyded allwies and yt is further Inacted by this present Pliaiment and by the authoritie of the same, that the said water shall not be conveyed throughe the House Garden or Orcharde of any pson or psons or throughe anye Parte thereof wthout Composicon to be firste hadd with the Owners and Occupiers of the saide Howses Gardens and Orchardes Provided alwaies that this Acte nor any Thing herein conteyned shall extende to gyve Libertie, as aforsaid to bring the saide Water or anye Parte thereof owte of his auncient Course to or for any Intente or Purpose menconed in this Acte, vnlesse everie suche pson and psons as are Owners of any Mylle or Mylles scytuare and standinge vpon or nere the saide Ryver of Mewe als Meye shalbe first compounded withall as afore-said, yf the sayede Milles shall by the bringinge of the said water or any Parte thereof vnto the saide Towne of Plymowth be impayred or hyndered.

It is curious to note the moderate way in which the dearth of water is spoken of in the Act as compared with the exaggerations of Westcote, Prince, and their followers :—There is “for the moste Parte of the yere, none, or at the leaste verey litle fresshe water within a mile”—and again “then a Myle or sometyme more, as the dryeth is.” The mile refers of course to the streams at Pennycomequick and Lipson, which flowed then as now, and can have undergone little change. There has been a suggestion that the Water Act must have been obtained by Drake because it refers to scouring the harbour endangered by the washings from the tinworks. This is wholly inadmissable. The harbour was Sutton Pool, then in the hands of the town, for the proper care and order of which regulations had been made well nigh a century before Drake was born; while there are yet extant a very full and precise set of orders for the “good kepyng of the poole & waterside under the

full sea marke," made by William Hawkins, mayor, John Fytz, recorder, and the "12 and 24," in 1568. So with the tin streamers. The action of the Corporation against them commenced before Drake saw the light at Crowndale; and in the very year of his birth, if we accept 1539 as the date, tin works were viewed for the town and evidence given thereon to commissioners at Plympton, while, under a presentment concerning the haven, by order of the Lord High Admiral a view was taken of Cattewater. So again in the next year.* We can trace this action against tinnerns and care for the haven continuously down to and after the passing of the Water Act and the making of the leat, and the only evidence that Drake took any personal interest in the business is that 4s. 4d. was spent in 1592-3 in wine when he and the "masters" went to view "the tin work." Works were again viewed and action taken in 1604-6. If Drake had been the only seaman connected with the town; if the harbour had never been cared for, nor tin streams viewed before his time; the suggestion might have some value, but the facts lend it no countenance whatever.

The Act was obtained in 1585. Nearly five years elapsed before the attempt was made to put its provisions into force. There is nothing to cause surprise in this. Between 1585 and 1590 the nation passed through such a time of peril as it never knew before nor has known since. Philip of Spain was planning the Armada when the Water Act was under consideration; and all the energies of the Corporation of Plymouth were concentrated on works of defence. They fortified St. Nicholas Island, at a very heavy expense, under the patent obtained by William Hawkins. They converted the ancient bulwarks on the Hoe into a "fort regular." They maintained a sharp look out and kept up an efficient garrison. With the aid of contributions from the countryside they fitted out a ship and a pinnace against the Armada.† They were so thorough-minded in their warlike ways that when Drake sailed for the West Indies, in September, 1585, they took a share in his adventure to the extent of £26, and received—I presume as profit—£18 15s. The latter entry runs—

Itm rec of Sr Fra Drake knight for the Townes
advent^r xvij^{li} xv^s

* 1541-2. 3s. 8d. paid for viewing "the streame Brok that descends downe hurtfull to the haven."

† Towards this John Hawkins gave £20.

It is most probable that before entering this John (afterwards Sir John) Trelawny, Receiver in 1584-5, had been repaid the advance thus noted :

More to hym xxvj^{li} for money disbursed by hym this yere to S^r Francis Drake knyght for the townes adventure wth him in this viage.*

The Accounts show very clearly what the extent of the burdens on the Corporate finance were. Then in 1585-6 while the receipts were £314 11s. 6d. the expenditure was £412 4s. 8d. ; and though the next year left a current credit balance of £36, the next, which was the Armada year (1587-8), entailed an expenditure of no less than £659 11s. 6½d. which had to be met by leasing out various properties on fines ; and in the year following the outlay was still as high as £408 3s., which on an average may be taken as nearly double the ordinary Corporate expenditure at that period in time of peace.

During the mayoralty of John Blitheman (1589-90) the Corporation felt themselves once more in a position to undertake the work, which they commenced, presumably, some time in 1590. There are, however, as usual no monthly dates to the various entries of payment ; and the first entry anent the matter is very preliminary.

Itm pd for a staffe to [take] the levell of the water	
& for mendinge the hedde, being broken and for	
ledde	vj ^d

We next have

Itm paid for hire of a horse to buckland for Rattenburye	
about ye water	xij ^d

By Buckland here we must undoubtedly understand the Abbey, Drake's residence, and from Drake's will we learn that Rattenbury

* Did the Corporation have a share also in the voyage of circumnavigation ? It seems very likely. We read in 1580-81 :—

Itm rec of S ^r frauncis Drake keneighte employed in the howse ap-	
poynted for ye Bridewell	lii

Gifts were so recorded ; and the only gift to the towne credited to Drake is the half of a broken brass cannon given by him and John Hawkins as metal for the church bells.

was his servant. Whether Rattenbury was sent, or sent for, is not clear, nor the exact nature of the business ; but immediately after this we find the Corporation engaged on the work.

Itm pd to Thomas Burden for ij horses hire to mevye for vewe of the water	xx ^d
Itm pd att the Church howsse of mevye for wine & milke	ij ^s vj ^d

This is all we learn about Burden and his connection with the undertaking, but it was evidently in some way advanced, for shortly after we read

Itm pd Peter Vosper to goe to Buckeland to knowe when the Judges did Come	xij ^d
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That is to say when the judges would come. The compensation under the Act payable to owners and tenants and millers was to be assessed by the Judges of Assize ; and from his position Drake was qualified to say when they might be expected. This and the entry concerning Rattenbury are all that in any way connect Drake with the water works until he entered into an agreement with the Corporation. The judges do not seem to have arrived then ; for the only other entry concerning them is under the following mayoralty (1590-91) :—

Itm paied to Peter Sylvester for a tonne of wyne w ^{ch} was given the Judges for their paines and helpe touching the water Course	xx ^{li}
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The judges were Sir Edmund Anderson, Lord Chief Justice of the Common Pleas, and Mr. Baron Stroud ; and if the compensation was assessed before the work was begun (there was power, however, in the Act to postpone this) they must have visited Plymouth shortly after Michaelmas, 1590.

The next series of entries which I have to quote is singularly interesting. We learn the name of the real engineer of the leat—the man who laid it out and saw to its execution, as appears by entries made when the work was completed. It is highly probable that Robert Lampen, whom we find employed also subsequently by the Corporation as a surveyor on the town defences, was the ancestor of one of the founders of this Institution, the Rev. Robert Lampen who delivered the address at

the opening of this building ; and whose father likewise bore that Christian name. Lampen seems to have been a resident.

Itm pd Robart lampen for Pl ^a nnynge & vewing the grounde for the water Course from mevie for vj daies	x ^s
Itm pd haywoode for vj dayes & newe writinge the vewe iiij ^{or} tymes	viijs vj ^d
Itm pd nicholas Jeane for iiij ^{or} dayes	iijs
Itm for theire dyett	viijs vj ^d

These entries are too clear and precise to require comment. They assert in words which it is not possible to interpret otherwise that Robert Lampen, with his assistants, laid out the leat and drew the working plans. The leat commences in Sheepstor, but so little beyond the Meavy boundary, that throughout the record the latter parish is assigned as its place of origin.

The Receiver's Accounts do not indicate that anything more was done upon the work in Blitheman's mayoralty ; but there is an entry in the "Black Book"* under his name.

Also this yere the composyton was made betweene the towne and S^r Frances Drake for the bringinge of the River of Mewe to the towne for w^{ch} the towne have paid hym ije^{li} and more c^{li} for w^{ch} he is to compounde wth the lls: of the land over w^{ch} it runneth.

If this, however, is really to be attributed to Blitheman's mayoralty I hardly know how to account for the fact that the agreement itself was paid for in the following year (1590-91).

Itm paid to m ^r heles man [Hele was now Recorder] for wrytinge owte of the articles of agreement betweene the towne and S ^r Francis Drake	vjs viij ^d
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That the agreement or contract—for such is the meaning here of "composition"†—was made very late in Blitheman's mayoralty, if at all, is plain ; but it is absolutely certain that it was in

* The "Black Book" of the Corporation, so called from its colour, contains a list of Mayors and a register of local events. The "White Book" records the bye-laws made by the Corporation. Both have also some miscellaneous entries. The Receivers' Accounts, with the Black and White Books, together give a complete statement of the proceedings of the Corporation in its municipal relations during the years noted.

† See the use of the word for the agreement to pay Sir Thomas Wise, *post*.

existence before December, 1590, when Drake is recorded (*vide* extract from the "Black Book" below) to have commenced his operations.

All the entries of actual work done on the leat fall in the next mayoralty, that of Walter Pepperell (1590-91). I cite them as they stand; but they cannot be in due order of date, since the charges at the rejoicings when the work was completed have precedence. In the majority of instances the Receivers' Accounts give the customary receipts and payments first, and then the casual, as they were paid by the Receiver or brought up for payment at the audit.

The first entry of the series is highly creditable to the gallantry of the "Masters" or Aldermen of that day :

Itm paid for provision when the mystresses Rade
first to vewe the water Course iij^{li} x^s viij^d

We can very well imagine the interest felt in the work when we find it thus made the occasion of a picnic out of the Corporate funds for the wives of the leading members of the Corporation.

And then we come to the entries connected with the "bringing in of the leate," which show that the rejoicings were conducted with full state and solemnity. A trumpeter accompanied Mr. Mayor to the river, and four others were sent to the leat to give loud welcome; salutes were fired by the gunners, rewards given to the leading actors in the work, and, according to the good old English custom, there was plenty of eating and drinking. Probably Drake and Christopher Harris were present; at all events messengers were sent to them in connection with the proceedings, which hardly tallies with the presumably traditional story of Sir Francis formally handing the water over. Indeed tradition here seems almost wholly at fault.

Itm for the hyer of a horse for a Trumpeter to Ryde
in compayng to the Riv^r xij^d
Itm pd to 4 trumpeters that were att the leate by
Mr. Maiors cōmaundemt v^s
Itm pd for horses for theym iij^s
Itm to a messeng thatt was sente to S^r Fraunce
Drake xij^d
Itm to a messenger sent to m^r harrys xij^d

Itm for hyer of two horses to Carry provisions to the leate	ij ^s
Itm for bredd carryed to the leate	vii ^s
Itm p to m ^r Whitakers for wyne to Carry to the leate	xl ^s vj ^d
*Itm for other pvisons sente the same tyme	xj ^s ix ^d
Itm to Henry Ellys for a dozen of bredd spente at the S ^r vaye of the water	vij ^s
Itm to John Hoop to Carry owte plancke to make the bridge att mawdlyn†	iiij ^d
Itm pd to workemen to make the bridge	iiij ^s
[There are also entries of the cost of the materials—a beam cost 2s., and other plank 5s. 6d.]	
Itm given to Robert lampyn in reward at the bringinge in of the leate	ij ^s vj ^d
Itm pd for x pounce wayghte of powder thatt was spente att the bringinge in of the Riu ^r	xvj ^s viij ^d
Itm to John Rewbye for a dynner att the bringinge in of the Ryu ^r ‡	xvj ^s
Itm to the gunn ^{rs} thatt daye	xvj ^d
Itm more spent vppon theym then	iiij ^s iiij ^d
Itm to Willyam Stockam servaio ^r of the woорcke- men of the leate in rewarde	xij ^s
Itm to the pson of Meavye in Clothe asmuche as cost	lj ^s
Itm to John Stevane one other S ^r vaior of the same woорcke	xiiij ^s

These entries show that the Corporation acted as the hosts and employers when they celebrated—at the Weir Head or somewhere at Meavy, and *not* in Plymouth—the completion of their work; the subject of rejoicing being apparently—not the *arrival* of the water in the town, but its entrance upon the channel which had been cut to convey it thither. Rewards are given to the “parson of Meavy,” who had made them welcome, or smoothed their way in some fashion unrecorded; to the surveyors who superintended the two gangs of workmen by whom the leat was made; and to

* To this point all these entries are consecutive.

† Mutley. The Maudlyn House was on or near the site of the Blind Institution.

‡ It will be seen that “leat,” “river,” and “water course” are frequently used as equivalent terms.

Lampen the engineer. It is thus clear not only that Lampen planned the leat, but that his plans were carried out. We find later that he exercised a general superintendence over the operations.

Itm given to the ij lampyns in reward touchinge
their paines taken aboute the leate . . . xxvj^s viij^d

Itm given to Robert lampyn and his brother in
reward for their paines aboute the water . . . xxvj^s viij^d

The part which Robert Lampen played in this business does not admit of the smallest question.

But we do not stop here. One of the most important entries of the whole series is as follows :

Itm paied over and above the Charges in this
accomp^te before mentyoned w^{ch} amount-
ethe to xvj^{li} xviij^s ij^d for and in bringinge
in of the leate and beside the money given
to S^r Fraunces Drake the some of, as by a
bill of pticulers appeared, the some of . . . xlvij^{li} viij^s vij^d

Unfortunately the bill of particulars is not preserved, but we can form an adequate idea of what it contained. The remainder of the entries indicate not only that the Corporation were the prime movers in bringing in the water, but that they had prepared to utilize it when it came home.

Itm paied for lead for to Convaye the water
w^{ch} is in waight 99^c $\frac{2}{3}$ 16 att viij^{li} the
tonne xxxix^{li} xv^s ij^d

Itm paied toward the Plumers labor xv^{li}

This plumber does not appear to have been a local man, for we read also

Itm for wyne when Moore the Plumer was here iij^s

Itm given to Moore the Plumer toward his charge
cominge hither v^s

However in the next year Plymouth had a plumber of its own, one John Wyllyams. An entry in 1591-2 gives the approximate date when the lead pipes were made or arrived.

Itm pd Mathewe Starkeys wyfe for selleradge of
the pypes of lead from the 17th of September
to the 16th of September 1592, at 8^d per
weicke xxxiiij^s iiij^d

In the same year we find the last of the charges for work done in connection with the leat proper.

Itm rec of Diu^rs parsons [persons] toward the charges of bringinge in of the water over and aboue that w^{ch} hathe byn paide owte to diu^rs psons vppon soundrie reckninge w ought to be paied, whereof mentyon is maide in a bill of the pticulars thereof iiij^{li} xvij^s

Itm pd for makinge of the brydge by the mylles & other worke viij^s

Then we have

Itm paied to S^r Frauncis Drake, kneight, towarde the bringinge in of the water w^{ch} the Receauer allowed him in his rente dewe for the milles for one yere att Michelmas 1592 xxx^{li}

And in the next mayoralty [Sir] John Gayer, 1592-3, we read

Itm paied to S^r Frauncis Drake, knyght, in full paiment of the ccc^{li} thatt the Maio^r and Coaltye were to paye hym for bringinge of the Riu^r and prechas of the land ou^r w^{ch} the same is broughte which is allowed owte of the mille rent w^{ch} was payable this yere xx^{li} xvj^s viij^d

Part of the money paid to Drake was thus a set-off out of the rent due by him on the town mills; not the mills on the leat, be it borne in mind, but those at Millbay. Other part was raised by loan, and some by gift, or by assessment. One entry of the latter character has already been cited. Here is another under date 1589-90, wherein at the close of the accounts it is stated—

More to deducte owte of this Charge for monye by mr. Blitheman rec of Richard hawkins in parte of paimnt of l^{li} given towards the bringinge in of the water xv^{li} w^{ch} xv^{li} the towne standeth indebted to the water xv^{li}

The levy element appears in the following entry of 1591-2 :—

Itm rec of Willyam Browne* for y^t w^c he was sett to paie toward the bringinge of the water v^{li} and for monyes thatt he receaued of the water monye more then he hath accompted for all amounting to xxv^{li} iij^s xj^d

* Browne was the Receiver of the year previous, in which the work was done.

Now Yonge in his *Memoirs* says:—"In mr Blythman's Mayoralty I finde the towne agreed with s^r F. Drake to bring in y^e watur and gave him £200 in hand."* This may be an adaptation of the entry in the Black Book already quoted, or it may come from an independent and now forgotten source. This, however, at least is clear: we find Drake receiving money which Richard Hawkins, son of Sir John, Drake's relative and early patron gave, in whole or in part; while in order to make up the agreed £300 the town had to rate, beg, borrow, and go into debt. This fact is most important when it is argued—as it has been—that Drake merely received certain out-of-pocket expenses. So, if Drake had been making a gift he would not have required the Corporation as recipient to tie itself down by legal forms, nor would he have marred the graciousness of his act by insisting on conditions which put a struggling municipality to such straits.

So far the total cost to the Mayor and Commonalty of "bringing in the water," independent of any work in the town, has been shown to be £488 11s. 6d., or about £2,750. Other items of expenditure will appear as we go on.

Up to this point it is I think clear that the water scheme originated with the Corporation; that they obtained and paid for the Act; that the leat was planned by their engineer, and that it was formed at their cost, partly by their own men, and partly by Drake, under contract. Is it possible to ascertain what share Drake had in the actual work? He is paid, it will be recollected, for "bringinge in of the Riu^r and p^rchas of the land ou^r w^h the same is brought"—£200 for the former and £100 for the latter. About the expenditure of this £100 we shall have something more to say hereafter. The only contemporary entry which records his operations is to be found in the "Black Book" under the mayoralty of Pepperell.

This yere on the† daye of December S^r Fraunces Drake Kneight beganne [the River‡] to bringe the Ry^r Mewe to the towne of Plymouthe w^h being in lenght about 25 myles he w^h greate Care and diligence [p^rformed‡] effected and brought the Riu^r into the towne the xxiiijth daye of Aprill the next after psentlie after he sett in hand to Builde sixe greast mills two at wythy in eck buckland p^h thother 4 by the towne the two at wythy and the two next to the towne he fullie fynished before Michaelmas next after and grounde Corne w^h theym.

* *Plym. Inst. Trans.*, vol. v. p. 526.

† Blank in original.

‡ Erased in original.

It is a curious fact that in this entry the clerk originally wrote that Drake "began the River"—*i.e. leat*—instead of "to bringe in the River"—*i.e. water*; and that he "performed" the work instead of "effected,"—the former expressions being struck through. I do not think these corrections, and especially the first, at all unimportant.

So far we have been dealing with direct facts; I have now to invite attention to certain inferences.

Two things are self-evident with regard to this work—the first, that Drake completed it, under his composition or contract aforesaid; the second, that he did not do the whole of it. To go further, we must consider the character of the leat itself. It was originally, in the words of the Act and other contemporary records, a mere "ditch or trench," at the outside six or seven feet wide, and not exceeding two feet in depth—simply a channel cut in the earth, banked up in the ordinary fashion of the ancient mill and miners' leats, with the material excavated. It was not 25 miles in length, but 17; and for half its course was simply the utilization of an older leat conveying water from the Meavy to Warleigh, and known as the Warleigh Mill Leat.

There are three witnesses to the existence of this ancient Warleigh Leat. First we have the tradition of the oldest residents in Sheepstor and Meavy that Drake did not make a new channel, but adapted an old one. This I have heard from several independent sources; and it was strongly insisted upon by an old man named Giles, who died a few years since at an advanced age, the repository of a great fund of district lore. Secondly, there is the actual existence of a stream of water issuing out of the Plymouth Leat near Roborough Mills, and flowing thence to Warleigh, a distance of nearly four miles, which cannot be classed with the supplies afforded to the estates of Whitleigh, Manadon, and Ham, through which the Plymouth Leat passes, and which it is said were granted in payment, or part payment, for the land taken. Thirdly, there exists documentary proof; for in the oldest extant record (1751) of the high rents of the manor of Sheepstor, of which Mr. John Bayly is now the lord, we read, "Another acknowledgment of one penny payable by Walter Radcliffe, Esq., for the running of Warleigh Mill Leat into Meavy River above Plymouth Leat headware."

This entry at once settles the position of the Warleigh Mill

Leat. The Plymouth Leat, and the Plymouth Leat only, fulfils the condition. If the expression "running" the leat *into* the river should cause any difficulty, that is removed when we bear in mind that the term is perfectly correct as applied to the channel, and that we say the same thing now when we speak of putting a service *into* a main pipe—the object being in both cases the conveyance of water *out*. The Plymouth Leat is thus an original work to Roborough Mills only, and really issues from the Warleigh Mill Leat instead of the Warleigh Leat from it.

This indeed is at once apparent from the plan of the leat, which clearly indicates that the original route was to Warleigh, and the divergence to Plymouth. Moreover, the section of the leat from the river to Roborough Mills is a ruder work than that from the Mills into Plymouth, and after centuries of improvement still preserves much of its original character of an ancient "potwater" stream. This is plainly seen, for example, in the remarkable bend at the entrance of the leat upon Roborough Down, about six miles from the Head Weir, where a surface detour is made three-quarters of a mile to avoid a cutting, which Mr. Bellamy, our Water Surveyor, informs me would not exceed ten feet, the straight course not being more than a quarter of a mile. It is impossible to believe that either Lampen or Drake beginning *de novo* would have made such a circuit; and manifestly we have here the simple difficulty-avoiding line of the old stream. So the course thence to the Roborough Mills is not that which would have been taken if Plymouth and not Warleigh had been in view. The Act, in its reference to mills *near* the Meavy, also points in all probability to this stream. Unimproved potwater streams of a like character, and probably of equal antiquity, may still be found in the neighbourhood—mere gutters, winding for miles in many a turn. One such runs from the Plym, at Plym Steps, to Redstone, at Sheepstor—a very good example of the rustic water engineering of those far back days. Here we can see what the Warleigh Leat originally was like before it was adapted to Plymothian purposes.

What then was the amount of work to be done? A trench averaging six feet in width and two feet in depth, allowing for sloping sides and occasional increase of depth by embanking, would not involve 2,000 cubic yards of excavation per mile; not more, I believe, than 1800.

However, we will take the larger figure. This will give for the eight miles of leat from Roborough to Plymouth about eight weeks work for 40 men, at eight yards each per day—a fair estimate of what a man would dig and throw to one side under similar conditions at the present time. Hence at the average weekly wage of 3s. the cutting would cost £48. We turn to the Corporate Accounts already cited, and find that the unappropriated amount spent by the Corporation “for and bringinge in of the leat” was £47 8s. 7d.—so close an approximation to the estimate that we seem justified in concluding that this part of the work was that carried out by the authorities of the borough, especially when we take the entries concerning the bridges thereon into account. There is really, however, a margin; for I have overestimated both the work done and the wages paid.

We can test these figures in another way, less distinctly local. Mr. T. Brassey, M.P., than whom no one can speak with more authority, states that the average cost of English earthwork per cubic yard is 3·63d., or some £30 for each 2,000 yards. Eight miles then would cost £240, and taking a fifth of this, to equalize the value of money at the respective periods, gives also £48. We have been so accustomed to exaggerate the character and extent of the work done when the water was first brought in, that figures like these appear almost ridiculously small; yet the fact remains beyond all controversy that the excavation of the leat for the whole distance in ordinary ground could have been accomplished in the days of Elizabeth for £100. If the Corporation did eight miles out of the seventeen at that rate, what did Drake do for his £200?

He did not spend it in compensation, for £100 had been allowed him extra for that; and apart from the millers' rights there can be no doubt, most of the land being, in the words of the Act, “barren or heathy,” that £50 at the outside would have been extravagantly sufficient to buy the fee-simple of the whole of the thirteen or fourteen acres required, which he did *not* do. The rights of water-supply enjoyed by the owners of Whitleigh, Manadon, and Ham have been already noted as traditionally said to be the equivalent rendered for the passage of the stream through these properties, but whether that be so or not, it is an undeniable fact that the Corporation had subsequently to pay Sir Thomas Wise for land taken in the parish of Stoke Damerell, and to buy the fee-simple of the land at Sheepstor from Mr. Elford.

There remains only one thing that Drake could have done towards "bringing in" the water—the enlarging of the old Warleigh Mill Leat. This is probably what he did do; less in the interest of the townsfolk than in that of providing for the six new mills which he erected. Whatever the capacity of the old Warleigh Leat may have been, it could not reasonably be expected to supply both Warleigh and Plymouth—the latter especially—with a "river" of mill-stream magnitude.

This allusion to the mills requires elucidation. If we deny that Drake was actuated by motives of pure philanthropy in his dealings with the water question—and the figures given wholly negative that supposition—we must conclude that he had in view some benefit to himself, though it would by no means necessarily follow that such an object involved any discredit. The erection of the six mills supplies the key to his undertaking the contract; for though he was amply paid for all work done on the leat, the simple profit thence derivable is not likely of itself to have tempted a man of his position.*

One of the most valuable portions of the ancient Corporate property of Plymouth was the Manor Mills at Millbay, which were transferred from the Priory of Plympton to the town under the Act of Parliament incorporation, and were in 1440 valued at something over £10 a year. This, indeed, was the rent paid for them long subsequently; but it afterwards advanced by degrees, reaching £19 in 1499–1500, then rising to £21, and in 1549–50 to £24. The value of the mill property was kept up by strict regulations providing that three times the just toll should be levied on any townsman who sent his corn elsewhere to be ground. Moreover the mills were rented at different times by some of the most prominent inhabitants. Thus in 1577 they were farmed by William and John Hawkins, who arranged to fetch the corn from the houses of the townsfolk when required. The rent was then £24, but in 1581–2 William Hawkins paid £40. Two years later (1583–4) Drake became the tenant at the same rent, and so continued until 1591–2, the year after the water was brought in, when his payment was reduced to £30. Drake was thus very intimately concerned in the prosperity of the town mills for seven or eight years

* He had money to invest; for after his voyage of circumnavigation he bought Buckland Abbey, and leased the tithes of Tavistock, paying down £1,000 fine, besides renting the Plymouth Mills, and proceeding with other expeditions.

before the leat was made, while directly he erected the mills on the leat, which came into competition with those at Surpool or Millbay, the value of the old mills was depreciated 25 per cent.

If we turn to the Water Act we find no reference to the erection of mills as one of the objects in view ; and we have seen that for the time at least their construction did serious injury to the original Corporate estate. Can there be any reasonable doubt—unromantic and prosaically business-like as the idea may seem—that the extension of his trade as a miller was Drake's leading object in what he did ? The Act belonged to the Corporation ; only by agreement with the Corporation could the right to erect the mills be obtained : what readier means of attaining this than by a composition under which Drake undertook at no loss to himself to complete the work which the Corporation had begun ; and to find the additional capital they did not possess for the erection of the leat mills, which under his agreement with them were at the end of 67 years to revert to the Corporation, but meanwhile were to be enjoyed by him and his successors ? Drake was the last man to act aimlessly ; and is there a better explanation of his motive to be given ?

"J. P." [John Prideaux], the "Perambulator" of the *South Devon Museum*, had a very shrewd notion of the truth, though wanting direct evidence, nigh 50 years ago, when he speaks of "Sir Francis having very probably been a more expert calculator of probabilities and capabilities than the worshipful magistrates of the borough ;" that "having brought the water in, he well knew what to do with it ;" and that his mill rental was "a very pretty thing in those times." Indeed "Perambulator" went so far as to suggest that "Sir Francis screwed his bargain tight up."*

That Drake made an excellent bargain there is indeed no doubt ; that the Corporation made a very bad one is equally evident. During almost the entire continuance of the Drake lease in the leat mills the revenues derived by the Corporation from the water were not enough to meet the mere charges of maintenance. The town was always out of pocket. When the mills at length fell in hand, they were worth at least £200 a year—for in 1660-61 three-fourths of the profits are set down at £233 16s. 11½d.—if we estimate the mills at Millbay as worth a third of the whole. That is to say, for 67 years Drake and his representatives under the lease were receiving at the rate of something like £1,000 a year—

* Vol. iv. 159.

or its equivalent in current value—as the return for an outlay of a few hundreds only at the outside, while the Corporation suffered a yearly recurring deficit. Neither Drake nor his heirs paid any rent for the leat mills; but the Corporation charged £4 4s. 4d. additional with the Surpool Mills as rent of the two closes of land on which the leat mills in the town were built, having to pay 43s. 4d. themselves as rent for the part of Baron's close on which the middle mill was erected.

There is further evidence of the value of the Drake lease in the fact that in 1628 the Corporation paid £1,500—equal to £7,500 now—for a moiety thereof as an endowment for the Hospital of Orphans Aid, when it had 32 years to run. And in 1641–2 the tithe of the mills paid by the Orphans Aid is set down at £10.

We can readily understand why the Corporation entered into this onesided arrangement. They were anxious for the water; they were anxious also, as the accounts over a series of years abundantly show, to stand well with their powerful neighbours. Drake they unquestionably held in great respect, giving him and his “lady,” as they did to John Hawkins, Raleigh, and other distinguished persons, sundry dinners.* Though under the Act

* This will be illustrated by the following extracts :

- 1582–3 Itm paide for the entertaynment of S^r frauncis Drake
knighte when his ladie came firste x^{li}
- 1584–5 The Mayor had £5 for the “dyett” of Drake and “my
ladye” and other Justices; while Mr. Hawkins had £4 and
Martin White £8 11s. 4d. for “S^r walter Rawleghes diett.”
- 1587–8 Itm pd for iiij^{li} of powder spent at the cominge in of
S^r Fraunces Drake iiij^s vi^d
- 1588–9 £4 18s. were paid Mr. Harris for Drake and Sir John
Norris and other gentlemen dining with the Mayor. Drake
and Norris were then setting out on their expedition to
Portugal, and bought sundry calivers and pikes of the
town. We read also :—
- Item for sending of Sir Frauncis Drakes warrante to
Plympton and to Millbroke and for wache and ward for
staing of marine's and souldie^{rs} vj^d
- 1591–2 Itm pd for a dynn^r to S^r Fr^aunce Drake at his
Comynge from London and his ladye and other gentle-
men and others of the towne iiij^{li}
- The same year a £3 supper given to “S^r Walter [Raleigh]
and his company” and others.
- 1587–8 Itm pd to Edward Fentwill for carryenge a Confession
vnto S^r Walter Rawley w^{ch} was taken of one arryved out
of Spaigne ij^s viij^d
- Itm pd to M^r Ric Hawkins for a Silver Cuppe w^{ch} was
geiven to the Ld. warden [Raleigh] xij^{li}

they had ample power to take the water, and levy penalties against all who interfered with them, Drake, through ties of friendship and family, represented an aggregate of property interests with which it was wiser to compound than, uncompelled, to strive. Thus they bought Drake's goodwill, and made the best of it. What they did of their own motion proves that if left to themselves they could have done without his help. Indeed his aid was in the end worse than useless; for—without intention—it became the fruitful source of controversy and litigation. The assumed philanthropy which Drake himself never claimed has cost Plymouth many thousand pounds.

When Drake died the mills at Millbay passed for the time into the hands of William Stallinge until Thomas Drake, Sir Francis's residuary legatee, obtained possession on the same terms as his brother. Before this, however, difficulties had arisen. The "Black Book" records under the mayoralty of Richard Hitchings (1599–1600) a great controversy "through wronges offered to the Towne by Mr. Crymes touching our Ryver."

We learn what these "wronges" were from the records of proceedings in the Star Chamber and elsewhere. Crymes, the owner of the manor of Buckland, apparently did not see why, if his friends the Drakes had mills on the leat, he should not enjoy the same advantage. Accordingly he proceeded to divert the stream, with the assistance of three friendly Justices—Sir John Gilbert, Tristram Gorges, and Henry Coplestone—who kindly assessed the damage to the Corporation at a shilling a year; while divers tinnors and others were encouraged to help themselves in a similar way. The ready fashion in which the three country gentlemen came to the aid of their brother landowner against the unfortunate Corporation aptly illustrates the position in which the Mayor and Commonalty stood with regard to the Drake interest, and the manifest wisdom of compounding therewith.

The entries in the Receivers' Accounts with regard to the action of William Crymes and Thomas Drake, speak with sufficient clearness for themselves. They run as follows:—

1598–9 Itm pd for carryenge a lre to Mr. Maynerde
of Tauistocke and for his paines in cominge hither
aboute S^r Fra Drakes last will and Testamt* . viij^s

[A copy of the will cost 17s. 4d.]

* Sir Francis left £40 to the poor of Plymouth.

1599-1600 Itm pd M^r Seriuent Hele for his

Counsell at the first time aboute the Leate . xx^s

[Subsequently he had another 20s., and a hogshead of claret costing 55s. (reason not specified); and Mr. Moore had 10s., while the Mayor and the rest of the "masters" went to "Oaston"—to see Mr. Harris?—on the same business.]

Itm pd for carryinge a Ire to M^r Thomas Drake . xij^d

[Another was sent later on.]

Itm pd Thomas Reanalson for charges in rydinge to Sharboure [Sherborne] to speak wth S^r walter Rawleigh aboute the water Course . xxvijs^s iiij^d

Itm pd M^r Boyes for lawes causes for the Towne as by his byll appeareth, touchinge the leate xj^{li} ix^s vj^d

1600-1 Itm pd for half a hogshed of Clarett wyne given to M^r Moore of Tauistocke for his kindnes and paines touchinge o^r water Course xl^s

[Other money was disbursed by Luxton the town clerk about "following the water."]

1602-3 Itm paid for M^r Drakes Co^mission as by the pticulers appeareth v^s viij^d

Itm paid for a dynn^r for M^r Draks Co^missioners when they were here about the water Course . xl^s

Itm paid m^r Towne Clarke for writinge out a copie of M^r Drakes lease of the milles and for his mans horsehire for two daies xiijs^s

Itm paid him for writinge a Copie of the deed of p^rchase of the water Course in p^rchment beinge two skynes of p^rchment xviijs^s

1603-4 Itm received of Collectors* towards the new timberinge of new bridge iij^l vj^s viij^d

[This was somewhere connected with the leat.]

* Money was frequently collected for various purposes—a rude kind borough rate. Thus in 1594-5 £44 6s. 8d. was subscribed to "defend the causes in lawe and secure the guard of the fort to the town; and £159 4s. 10d. collected toward the bells; and in 1597-8 we have

Item rec of diu^{rs} psons vppon a Collection towards the Charge of the defending of S^r Fardinando Gorges lxxxxviij^{li} ij^s vj^d

Itm pd towards Mr. Sparcke Mr. Baron and Mr. Parkers charges at ye Courte aboute the Townes busyness *more than was collected* [the words in italics are erased] viz. to Mr. Sparcke £13 8 to Mr. Baron £48 to Mr. Parker £46 cxxxviij^{li} viij^s

- Itm paide to John Woolcombe towards the amendinge of new bridge which the leate brake downe [marginal note : This Mr Drake must paye] iiij^{li} vj^s viij^d
- Itm paide for a dynner for S^r John Hele m^r Crymes and m^r Drake when they were here abowte the water Course vi^{li}

These entries point distinctly to a claim of some sort set up by Thomas Drake, who, by the way, as a member of the Corporation was behind the scenes, which had to be settled by the visit of a Commission. Its exact nature is not clear, but it is not unimportant to notice that just before this the town had been deprived of certain of its muniments. The entry referring thereto, under date 1601-2, is very curious :—

- Itm rec of Nicholas Goodridge of Totnes m^rchaunte vppon an agreement made between the Towne & him for an offence Comitted by him the said Nicholas in burning of a Cheste in the Councill Chamber wherein were Contayned divers evidences and writings Concerninge the Towne c^{li}

What is still more important is that we have here distinct statement of the "*purchase* of the water course"—whether that may or may not mean the Warleigh Mill Leat, or whether it was made under the claim set up by Thomas Drake, or at any other time. What the Corporation had it paid for. It is to be observed too, as before noted, that in addition to the leat mills, Thomas Drake and his successor Francis, the first baronet, held the ancient mills at Millbay (which Thomas first rented in 1600-1) up to the year 1630-31, the date of the sale of the lease to the Orphans Aid. Altogether about £30 = £150 is recorded as the cost of these controversies with Crymes and Thomas Drake.

It will be of interest to show what the Corporation did with the water when they got it, and the way in which they at once proceeded to utilize it.

One of the first things was to convey the water to Cockside, which was carried out in 1591-92, as shown by the following entry :—

- Itm pd to M^r Speareke maio^r for the charge of Carraidge of the water a Cocke syde xiiij^{li} vj^s viij^d

Work must also have been done on the Conduits, and private supplies granted. The lead pipe already mentioned was of sufficient length to bring a stream from the leat into Old Town, whence or from the Conduits it was allowed to flow in channels through the streets down to the water at Sutton Pool. The first payments for water were made in 1592-3 by Peter Silvester, a man of active business habits, who appears to have had something to do at one time with the Pool, and William Kempe, the schoolmaster, who farmed the vicarage.

Itm rec of Peter Silvester for water mony xxx^s of M^r
Kympe for the like xv^s xlv^s

The same year the first three Conduits were completed, at the sole cost of the Corporation.

Itm pd for buyldinge of three Cundyttys and bringinge
of the water to the Guyldhalle in ledd cxlix^{li} vjd

Next year a Conduit was made at the Southside, the lead pipe being bought of John Welles of Exeter; and in 1595-6 £8 were paid to John Burden for bringing the water to "the old Conduit," while various small repairs were done to the leat; in 1596-7 the Conduit at Church Style was paved; in 1597-8 the water was brought "in pipes at the Foxehole," and a Conduit made there, at a cost of £48; in 1598-9 the leat was "amended" and "ridded" [*i.e.* cleansed], and the leat "made" by the middle mill; in 1599-1600 the "bridge at Mawdlyn" was repaired; and in 1600-1 we have the first definite entry of water rents, which after a few years merge into the ordinary town rents. The payments by Silvester and Kempe may have been in the nature of fines for grants.*

Itm receaued of W^m Neelde and Richard Jooye Col-
lecto^{rs} of the Rents yerelie to be pd to the Towne
by suche as haue the water brought and Converted
[turned] into theire houses into Cocks iiij^{li} ij^s

In this year, too, the Council made an order that no one should take water from the great pipe without leave on penalty of £40; and in the ensuing mayoralty N. Downeman, who owned a quay,

* The ordinary charge was 4s. a year, and in 1608 thirty-eight persons were supplied. John Waddon paid 10s. for the Mill Leat; and the horsepool formed without what was afterwards Frankfort Gate—the margin of which was planted with elms as a public walk in the last century—was also rented.

was actually fined £20 for not suffering the Conduit water to pass to the Cock and Conduit on Southside. In 1602-3 a Conduit was built in Bilbury Street, towards which £22 6s. 10d. was collected; and the Conduit without Old Town or North Gate was erected at considerable cost—it had a leaden cistern, and was ornamented with carvings of arms. Two years later Walter Mathew commemorated his mayoralty by giving the town a Conduit by the “Great Tree at Brittainne side.”

M^o that the Condet w^out the Eastgate by the Tree was buylte at the pper Coste and Charge of M^r Walter Mathewe then maior.*

Drake did not compound with all the owners of property in connection with the leat, and the Corporation had to defray what was left unpaid after his death. The entries will explain themselves:—

1603-4 Itm given to M^r Walter Elforde his Freedome and one hundred of deale bordes in regarde of the inheritance of the weare heade of the water that cometh hither to Plymouth, wher the maior and his brethren do vsuallie ride once a year iiij^{li} xiiij^s

[In the margin it is written] “This some of £4 14s. was repaid againe in the account following to the next Receuo^r and the bordes are yet owing vnto M^r Elford.”

The debt however did not long remain unpaid, for we have in 1607-8:

Itm geuen to M^r Walter Elford one hundred of deale Boardes w^{ch} are delive^d and also his freedome for y^e absolute inheritance of the hedd weare in the Ryver and the water leate of the water of meawe als meavy that runneth thorough his lande towards Plymouth w^{ch} Boards cost iiij^{li} xiiij^s

There is a peculiar interest in the first of these entries, because it shows that “The Fyshynge Feaste” originated in one sense practically with the leat, in the periodical survey of the water, which was no formal or feasting matter when the Corporation had

* He had previously given houses to the “vse of poore fatherless children.”

to maintain their rights against an ever-ready band of encroachers like Crymes and his associates.

The second payment recorded is, oddly enough, for land at the other end of the leat. The entries are :—

1604–5. Itm p^d for an Ordynarie to Bentley vppon
the Comysson betweene the Towne and S^r
Thomas wyse xvij^s x^d

1605–6. Itm p^d for a dynner for S^r Thomas Wyse
knight [Lord of Stoke Damerel] and others
w^{ch} came aboute the water Course . . . xvij^s

Itm p^d to Robte Trelawney for three hoggsheds of
Clarett wyne geuen to S^r Thomas wise
knight for the soyle in the leate in his
Orcharde at Stoke Dam^rell thorough w^{ch} the
Towne Water is Conveyed, and for his right
in the wast grounde & Key by the Barbican . . . xiiij^{li} x^s

1606–7. Item p^d for two hoggsheds of Clarett
wyne sent to S^r Thomas wyse knight in
full payment of the Composition betweene
hym and the Towne for the soyle of his lande
in the water Course and his right in the
grounde & soil of the southside key . . . viij^{li}

Neither Drake, therefore, though he received £100 to compound with the landowners, nor his brother and heir, Thomas Drake, after him—paid for the land for the most important part of the works, and the Corporation had to spend upon Elford and Wise no less than £27 4s. We do not know the value of the land at the Barbican, but as a set-off to that we have Elford's freedom, a matter of very real money value in these days of exclusive trading and trade privilege.*

The Conduits, by the way, were kept in repair by contract, and 40s. extra were given to the contractor in 1607–8, for mending the lead pipes burst by “the laste great froste being an extraordinarie charge.”

* People were made to pay for “inhabitinge within the towne,” not being free, and were not suffered to trade. Thus in 1585–6 one Glanville, of Tavistock, was fined 20s. for buying and selling in the town, not being free. In 1594–5 Nicholas Glanville, of Tavistock, probably the same, had to pay £6 for a “fine of linen cloth bought in the borough by his man of a Burton seized by the Town as foreign bought and sold.” In 1633, one “Eliot of Exon” was fined £3 for buying tallow of an Irishman, “being a straunger and making breach of the privilegedes of the towne.”

Such then is the history of the origin of the Plymouth Waterworks as set forth in the Municipal Records—the only absolutely contemporary and official statement of the proceedings of Sir Francis Drake and the Corporation. I submit with confidence that these records can bear no other meaning than that I have assigned to them. They prove conclusively that the water scheme originated with the Corporation; that the Corporation procured the Act of Parliament under which it was carried out; that their surveyor, Robert Lampen, was the real engineer of the undertaking; that they made a large portion of the leat by their own workmen; that Drake's share was that only of a well-paid contractor; and that from beginning to end every farthing of the cost was borne by the Corporation. Including the first outlay on Conduits, &c., a total of over £850, or between £4,500 and £5,000 in present money, was found by the Mayor and Commonalty for this purpose, and that at a time when the average regular yearly income of the Corporation did not reach £350.

Among the many arguments that have been used in support of the Drake origin of the leat, one, upon which some stress has been laid, is that the Corporate Records *may* be incomplete, and that Drake *may* have done many things in this regard of which no entry exists. It is a sufficient answer that the entries as they stand account for the whole work. No other powers were needed than the Act confers; Lampen was an efficient engineer; the money spent by the Corporation itself and handed over to Drake was enough for the execution of the entire scheme. There is no room left for the exercise of Drake's influence or generosity. Besides, the Municipality of the day were not ungrateful. They acknowledged the "care and diligence" with which Drake carried out his contract. They were always careful to note benefactions. The "Black Book" sets forth the gift of the "Union Cup" by John White, in 1585, the very year of the Water Act; the Receivers' Accounts perpetuate the memory of the liberality of Walter Mathews in erecting a Conduit; they note that Drake and Hawkins gave the broken brass cannon towards the bells. If Drake had done anything worthy of gratitude or record in connection with the water beyond his composition, assuredly it would have been set down. The idea that he did so is, however, the fiction of a later age.

To contradict a story so full and so intelligible as the Municipal Records thus set forth, the strongest testimony must be adduced. Let us see what is the value of the contemporary or quasi-contemporary and traditional evidence upon which it is argued—either that Drake *gave* the water to Plymouth ; or that to him the credit of the initiation and execution of the scheme is due.

Contemporary evidence, 300 years since, is subject to the same rules as contemporary evidence now ; and its value really depends upon the credibility of the witness and the opportunities he had of acquiring information. The mere fact that an account of an incident is written within a year or two of the occurrence, in itself gives the narrative no absolute value ; but simply establishes a presumption that the writer might have had direct access to qualified informants. If he has his authority tenth or twentieth hand, for all practical purposes he may almost as well have lived a century or two after the event to which he is called to speak. What has been cited hitherto is the contemporary evidence of those who were themselves the witnesses and directors of the things recorded.

The first contemporary writer in point of date who alludes to Drake and the water is Charles Fitz-Geffrey, born at Fowey, who in 1596, when he was twenty-one years of age, and resident at Oxford, wrote a poetical panegyric on Sir Francis Drake, dedicated to his widow, in which occur the following stanzas :

Equall with *Hercules* in al, save vice
 DRAKE of his country hath deserved grace,
 Who by his industrie and quaint devise
 Enforc'd a river leave his former place,
 Teaching his streams to runne an uncouth race :
 How could a simple current him withstand,
 Who all the mightie Ocean did command ?
 Now *Plymouth* (great in nothing, save renowne,
 And therein greater far, because of DRAKE)
 Seemes to disdaine the title of a towne,
 And lookes that men for cittie should her take ;
 So proud her patron's favour doth her make :
 As those whom prince's patronage extold,
 Forget themselves, and what they were of old.
 Her now bright face, once loathsomly defilde,
 He purg'd and clensd with a wholesome river ;
 Her whom her sister-citties late reviled,
 Vp-brayding her with unsavory savor,
 DRAKE of this opprobry doth now deliver :
 That if all Poet's pens concealed his name,
 The water's glide should still record the same."

We have here a professed eulogy, high-flown even for those days of euphemistic hyperbole, in which the youthful writer not only equals Drake to *Hercules*, but cites *Neptune*, calls upon *Jupiter* to take his hero to heaven, and says—not that Drake gave the water to Plymouth, or that he originated the scheme, or paid for it, but that

Her now bright face, once loathsomly defilde,
He purg'd and clesned with a wholesome river.

A statement which is nothing more than a florid and highly imaginative rendering of the plain prose, "Drake brought in the water"—conditions not stated. I call Fitz-Geffrey's language highly imaginative because he endeavours to exalt Drake by magnifying his work and depreciating his surroundings, at the manifest expense of plain truth.

The Meavy had left "his former place" and run an "uncouth race" to Warleigh long before Drake knew Buckland; and whatever new and "quaint devise" was introduced was Lampen's. Plymouth had flourished for centuries before Drake was born; and survived not only his death but that of her earlier Elizabethan patrons, the Hawkinses. Instead of being "great in nothing save renowne" it was one of the chief ports of the kingdom—populous and wealthy; and Fitz-Geffrey's "loathsome defilement" and "unsavoury savour" are nothing more than random flights of poetic fervour. There is the fullest proof in the Corporate Accounts that the town was as well paved and drained and cleansed as any neighbouring "city;" and that its Corporation had rather advanced views of sanitary science. They understood quarantine perfectly well; and when the plague was imported and fostered by the soldiery, who at times were quartered here in immense numbers, they were enlightened enough to erect wooden hospitals at Batten and Lipson, and to take measures for isolation. The only difference the introduction of the water made in this relation was its being allowed to run through the gutters.

To show what the Corporation really did do to keep the town "sweet" I quote at intervals over a century or so a few illustrative entries out of many. They prove a continuous care exercised in many directions:—

1494-5 A gutter made in "Wympell strete"—for
Redying of y^e same gutt' a man iij dayes yn ye
vycary is gadyne xv^d
Money spent on the "Putchyng of Trevyllys strete"

- 1495-6 Itm p^d to the pavyor for mendyng of the
Kyngs hey wey yn Spesery strete . . . ij^d
- 1502-3 A common conduit mended in "Seynt
Andrewys strete"
- 1517-18 It p^d for Castyng down & makyng ageyne
of the oldewall by the Fryers lane & ryddyng
of the strete there to ij workemen a grote . . . v^s iij^d
- 1528-9 Mr. Speckett's "house in the vyntry pluckyd
downe by the Kyngs enquest"
- 1539-40 18^d spent in paving the street before the
corn-market house
- 1580-81 Earth taken to the Churchyard and the
graves banked.
- 1584-5 Itm paid for convaience of the water over
the Southeside Kaye thatt rennes from Mr.
Sperke's newe streate iiij^s
A new street paved leading towards the new Quay
- 1590-91 A great deal of paving done
Itm pd to m^r Fownes w^{ch} he disbursed to suche
as theire howsses were shutt vppe of the Plague v^{li} xix^s
- 1596-7 Itm p^d Thomas Edwardes for prohibitinge
the Townes men for Carriage of fier by neight ij^d
- 1597-8 The marriners of a "shippe y^t came from
Barbarie to remayne a borde in regarde of theire
sicknes."

There were very strict regulations providing for the wholesomeness as well as the fair price of all manner of victuals; and in the orders made for the regulation of Sutton Pool in 1568, in addition to those against the fouling or throwing of rubbish into the Pool itself we read:—

- Itm that no psonne ne psons nor there s^runts bryng
any kynde of stingkyng thyng to the waters
side, as Fyshe Flesh deadd beasts as doggs cattes
swyne or any other thyng upon payne to For-
feit for eury such offence iiij^s iij^d
- Itm that no guttyng ne heddyng of Fyshe be caste
on the Kayes or left vpon the Kayes, but that
the same be caryed from tyme to tyme wthowt
the causse upon payne to Forfeete for eury such
defaulte xij^d

It was the custom to give notice by the bellman to the inhabitants to hang out their lights in winter, to clean the streets, &c.

It is quite plain that Fitz-Geffrey either did not know Plymouth, or that knowing it he wrote of it that which was not true. As a matter of fact his acquaintance with it was but casual, on his way between Fowey and Oxford; and he had been a student at the University from 1590, so that we may acquit him of anything worse than random phrase. It would not be worth while to argue gravely against the inaccuracy of statements that probably were not intended to be literally believed, were it not that he has been quoted as an authority. His object was to eulogise Drake, and he was so far successful that Sir Anthony Rous, one of Drake's personal friends and executors, gave him the living of St. Dominick. Historically the poem has precisely the same value as a last century dedication, and to all appearance had much the same origin.

Camden comes next in order. Several editions of his *Britannia* appeared between 1586 and 1607. He speaks in warm praise of Drake, but says *nothing* concerning the water, though hasty readers of Bishop Gibson's translation have imagined otherwise. In Gibson's *Britannia* we indeed read of Drake that "by his contrivance, and at his own proper charge, there was brought hither [Plymouth] a large stream from a great distance, through many windings and turnings, which is a mighty benefit to the place;" but these are the words of one who was so far from being a contemporary that his second edition, from which these words are quoted, appeared in 1722. Camden therefore is silent; and his silence would count for something, if its notice were essential to the argument.

There is an allusion to the water in "Sir Francis Drake Revived," written by one of the family, published 1626 and subsequently, in which Drake is credited with "filling Plimmouthe with a plentifull stream of fresh water"—light words to represent the views of later times, but perfectly consistent, though ignoring the chief actors, with the main facts. The indefinite language of these earlier writers is very noteworthy when contrasted with the full assumption of knowledge on the part of their successors.

Third in date is Westcote, who in his *View of Devon in 1630*, says of Plymouth:—

The streets are fairly paved, and kept clean and sweet, much refreshed by the fresh stream running through it plenteously to their great ease, pleasure, and profit, which was brought into the

town by the skill and industrious labours of that ever to be remembered, with due respect and honourable regard, Sir Francis Drake, Knight, who, when it was a dry town, fetching their water and drying their clothes some mile thence, by a composition made with the magistracy, he brought in this fair stream of fresh water. The course thereof from the head is seven miles ; but by indenting and circling through hills, dales, and waste bogs, but with greatest labour and cost through a mighty rock, generally supposed impossible to be pierced, at least thirty. But in this his undaunted spirit and bounty (like another Hannibal making way through the impassable Alps) had won the victory, and finished it to the great and continual commodity of the town and his own commendation.*

Here again, as with Fitz-Geffrey, we have fact and fiction ; but the lapse of forty years have made the latter show signs of growth. Westcote as a youth was contemporary with Drake, but had no direct connection with this part of the county, and no means, that we are aware, of personal acquaintance with the facts. He exaggerates the water difficulties of the inhabitants by saying that they had to fetch their water and *dry* their clothes—which one would have thought were dry enough already in Plymouth—a mile away ; and he magnifies the work of constructing the leat by adding on the mere trifle of thirteen miles, and by assigning to Drake the role of Hannibal in taking it “through a mighty rock generally supposed impossible to be pierced,” not to reckon “the hills, dales, and waste bogs.” Every one who knows the course of the leat will recognize the extravagance of this language, and will wonder what became of the “mighty rock,” which no one in modern times has ever been able to find save on paper. But it is very doubtful how far Westcote is to be regarded as in the fullest sense an original authority. In Risdon’s *Survey of Devon*, commenced in 1605, and finished in 1630, we read :—

The streets are kept clean by a stream of water running through them, to the no less profit than pleasure of the inhabitants, performed by the skill and industry of that ever to be remembered with praise Sir Francis Drake, Knight, and which formerly, for want thereof, stood much distress. Of this stream the head is distant 7 miles ; but in its ambage by hills, and through dales, especially one main rock thought to be impenetrable, at last is become the travel of twenty miles.†

* p. 378.

† p. 203 ed. of Rees and Curtis.

Both accounts are connected ; and one must have been partly copied from the other. Risdon and Westcote were contemporary ;* but Risdon, though the younger man of the two, appears to have been the first in the topographical field, and Westcote indeed acknowledges the value of his work. Westcote's narrative in fact has all the signs of amplification both in fact and fiction, and illustrates the early development of the Drake myth, of which the only trace in Risdon is the "main rock." But even Westcote, if we take his self-contradictions into account, carries the Drake case no further ; for we read that it was "by a composition made with the magistracy he brought in this fair stream of fresh water."

Lastly, we are referred to Fuller, who, though not in strictness contemporary, is so claimed on the score of his having had communication with Henry Drake. Fuller in the *Holy State* says of Sir Francis that he hated

Nothing so much as idleness : And therefore lest his soul should rust in peace at spare hours he brought fresh water to Plymouth.

These, then, are all the printed authorities that have any claim to be regarded as contemporary. Neither Fitz-Geffrey nor Fuller go beyond Drake's "bringing" the water in ; and Westcote, who seems to do so, but upon points of detail is proved thoroughly untrustworthy (even without the criterion of the Official Records), dates the work back to the composition or contract which was in truth the basis of Sir Francis's connection with the undertaking.

But there is yet other contemporary testimony ; and the earliest and most important is a letter written in 1601 by the Mayor and his brethren to Robert Cecil asking his aid against Crymes. The reason why they wrote to Cecil is also important, as bearing upon the suggestion that the town may have been largely indebted to Drake for his influence at Court. Cecil was a man of far more constant and weighty influence there than Drake, and Cecil was the Lord High Steward of the town. We cannot trace the exact date of his appointment, but he was the first Lord High Steward who had a salary—£10—and this commenced in 1597-8. His

* Risdon was born in 1580 ; Westcote in 1567. Westcote died somewhere about 1633 probably ; Risdon in 1640.

connection with the borough was, however, of earlier date. Thus we read in 1591-2 :

Item pd for a dynner expectinge S^r Robert Cessell
Comynge w^{ch} came not, but my ladye Drake M^r
Harries M^r Stroude and some of the M^{rs} of the
town iiij^{li}

It is hardly possible to exaggerate the importance of this letter of the Corporation, which is given in full from the original in the Public Record Office, copied by Dr. H. H. Drake. Even without the entries in the Corporate Accounts, it effectually disposes of the traditional Drake claim ; and with them it is absolutely conclusive. Clearer language could not be used than the statement of the Corporation : " We procured from her Maty by Acte of Parliament . . . some part of the River Mevy, to be brought to our towne, which cost us and Sir Frauncis Drake, who *upon composicion with us* undertook the bringeing home of the same, a greate some of money. We have compounded and purchased of the owners the lande over which the same runneth." The "greate some," or the quota spent by Drake was, I have shown, upon the mills, handsomely repaid to him by the grant of the mill lease.

Thomas Payne Mayor and his brethren. To the Right honobl.
Sr Robert Cyciil, Knight principal Secretary of our Sovarign
Lady the Queene.

As we have allwayes heertofore founde yor honorable favour in any our affayres, so we now humbly crave the Contynuanee of the same in this our present occasions. We procured from her Maty by Acte of Parliament in the 27th yeere of her happie raigne, some parte of the River Mevy, to be brought to our towne, which cost us and Sir Frauncis Drake, who upon composicion with us undertook the bringeing home of the same, a greate some of money. We have compounded and purchased of the owners the lande over which the same runneth. And so have held and enjoyde the same ever since until now of late Willyam Crymes esquier, and some of his complices, seeking our disherison and the keepinge away of the same water from us, hath lately erected certain classe (?) milles and Tanpitts where were never any before, and hath and doth riotously and unlawfully diverte and torne out a greate parte of our said River, to his said milles and Tanpitts for which we have suets dependinge in the starre chamber before yor honour and the reste of her matys most honbl. privy Counsell where the said Crymes found such favor the last terme upon his motion, as the same matter was referred by their honours to the

three cheefe Justices of Assises of this Circuit, and conceavinge his doeing and proceedinge were against law and justice, And findeigne the said Justices inclyninge to certify so much unto that honbl. courte, he procured Sir John Gilberte Knight, Tristram Georges, and Henry Coplestone, esquires, to sett downe an order under their hands, that the said Mr. Crymes and his heires shall diverte and have some parte of our said ryver, to serve his said milles, payeing us xiid. the yeere, which will tende to our utter disinherisson, and the overthrow of our whole towne, ffor if the said Crymes be permitted, to tourne out and take any parte of our said water, others over whose lande the same ryver is convaide, will do the like, and so we shall have none to come to our towne, as by a particular of our greevances (wheaewith this bearer will acquaynt yor honor) may appeare, wherein we most humbly crave yor honbl. favour, and so with our humble dueties, and harty prayers for your honors longe preservacon humbly take our leave. Plymouth, the xiiith of the instant September, 1601.—Yor honors at Commandemente, Thomas Payne Mayor and his brethren.

There are a few other references to this suit in the Municipal Records and the State Papers, which show that among the defendants with Crymes were Richard Hele, John Browne, Richard Browninge, Richard Cripps, and John Edwards. It is worth while noting that the leat mills, though leased to Drake, were treated by the Mayor and Commonalty as their own :—

The mills erected by the complaynants uppon the said new river are any way prejudiciall or hurtfull to any y^{or} Highness Subjects, but verie beneficiall to a great multitude of y^{or} Maties Subjects as well inhabiting hereabouts as to those alsoe which by sea arrive thither with shippinge in the more readie and speedy victuallinge and furnishinge them with necessaries and otherwise.

It was in fact only under the powers obtained by the Corporation that Drake could erect the mills at all ; and it was in their own capacity and not as in any way representative of or empowered by him, that they defended their rights. Had any authority been derived from Drake, or any gift been made by him, the Corporation must have shown it to establish their title.

Next in point of date is the couplet on the Corporation portrait of Sir Francis—

Who with fresh streams refreshed this town that first,
Though kissed with waters, yet did pine with thirst.

This again does not go beyond "bringing in the water;" and the only further remark called for is that the portrait was placed in the then new Guildhall just twenty-one years after Drake's death.

1616-17 Itm pd for drawinge of S^r Frances Drakes
picture and other charges towards that lijs^s

At the same time the arms of Sir John Hawkins and Sir John Hele were placed in the Guildhall windows at a cost of 33s. 6d., exclusive of a "grate of wyre before the armes," which cost 13s. 10d. The king's arms were also gilt and the Guildhall painted at a cost of £3 7s. In the next year the king's arms were "amended," and the prince's and duke's [Buckingham] added.

Lastly, in this connection, we have to consider what contemporary or quasi-contemporary evidence is offered by the remains of the Old Town Conduit, built into the wall of the reservoirs in the Tavistock Road. Those remains consist of two inscriptions, one in granite and the other in limestone; and sundry armorial bearings. The one inscription, that in granite, reads

Made in the maioraltie of Iohn Trelawnie, 1598.

The other on a limestone tablet, runs

S^r Francis Drake first brovght the water into Plymouth in 1591. This conduit was rebvilt in the maioralty of William Cotton, merchant, 1671.

The reference to Drake, which again stops at "bringing in the water," is thus, not of the date of the original Conduit, but of its successor, and instead of being contemporary is 80 years later.

But what of the Drake arms thereon? They are those of Drake, not as borne by himself,* but by his brother Thomas, the fesse and pole stars. Does not, it has been asked, and naturally,—the appearance of the Drake arms on the Conduit indicate a special indebtedness to him? Undoubtedly this might be a fair assumption if they were contemporary; but they are not. Drake was never recognised on the original Conduit, and the recognition of 1671 is due not to current fact but to developing tradition. I do not rely

* See his seal in the Plymouth Records—the original wyvern quarterly with the augmentation of Elizabeth.

upon the character of the work for the date of the Drake arms. Here is the direct proof:

1670-71 John Somerton paid £6 for cutting the arms of the king, town, and Drake for the Conduit without the Old Town Gate this year rebuilt.

The only arms entered as being cut for a Conduit at the earlier date are those of the king and town.

1602-3 Item for Cuttinge and settinge vp of
the Kinges and Townes Armes in the new
Cundyte v^{li} xi^s vj^d

There was no thought of commemorating Drake then. In 1639-40 the arms on the "Conduit without Old Town Gate" were new painted, and this further identifies the position of those cited in the entry.

There is a curious entry concerning this 1671 Conduit in William Allen's MS. diary:—

The conduit without y^e old town Gate new built by W^m Cotton major* alsoe a new pipe added to bring in more water to y^e Town and all y^t had y^e water before paid 10 yeres rent before hand towards it.

Contemporary evidence, real and alleged, thus carries us no further than the simple statement of the Official Records that under his contract Drake "brought in" the water, a phrase of itself indefinite, and for the full meaning of which we must look elsewhere. One may *bring* a thing to a place of his own motion, or simply as an agent; precisely as we say now indifferently of a capitalist, an architect, or a contractor, "He *built* that house," but with a different meaning to each application of the term which the context of fact or statement can alone supply. Here it is equally true to say of the Corporation or of Lampen or of Drake that they brought in the water; and the special application to Drake is limited by the considerations already stated to the work done and paid for.

We now turn to tradition, the value of which when duly tested and confirmed no one can deny. Tradition, however, cannot be

* Here Cotton is said to do what was simply done in his mayoralty.

called to contradict established facts. At the best it is hearsay, and for the most part of the loosest kind. I include under this head professedly historical statements which cannot be traced to any directly connected source, and which presumably are but the perpetuated reflex of traditional stories current when they were penned.

The most important Drake tradition is that of "The Fyshynge Feaste"—its two toasts, "The pious memory of Sir Francis Drake," and "May the descendants of him who brought us water [not *gave*, as it is sometimes misquoted] never want wine." The whole value of this evidence depends upon its date. We may say at once, with absolute confidence, that the toasts are subsequent to the time of Drake, and that they originated when the old business-like water survey had degenerated into something like the modern formality and picnic. To me also it seems plain that they originated at a time when Drake was no longer a living memory, but a great name. I cannot believe that men who knew he left no descendants would stultify themselves so far as to wish good fortune to beings who never existed. It is replied to this, that in genealogical phrase a man's blood successors, collateral or otherwise, are his descendants; but I cannot help thinking that the ancient corporators of Plymouth would use the word in its every-day acceptance as men of common sense, and not in a merely technical application. Of course when a generation or two had passed the real fact would be overlooked. "The Fyshynge Feaste," as we have it, originated about the end of the seventeenth century, when another Sir Francis Drake, great-grandson of Thomas Drake, was Recorder (he held office from 1697 to 1717), and exercised for some time dominant sway in the Corporation, obtaining in the former year a renewal of the old charter, taken away by Charles II. in 1684, with a recasting of the Council.

Here the Corporation Accounts do not help us. They give yearly the expenditure on Freedom Day, and sundry other stated times of public refreshment; but they are absolutely silent as to a Fishing Feast, which must have been paid for—if the charge fell on the Corporate purse at all—out of the proceeds of the mills when they came in hand, then entered net, or included in the collations which commenced to be given to the Grand Juries towards the end of the seventeenth century. There are a few entries of visits to the head weir, but purely of a formal character; *e.g.*

1633-4 Itm paied Pascow Rooe for his Charges &
horse hier vnto Shatstor to view water by m^r
maior's appointmente ij^s iiij^d

1634-5 Itm pay^d M^r Nicholls and others that went
to view the Towne Leate vij^s iiij^d

The *Annual Register* of 1761 shows that the Feast was then an annual custom; and a bill for the dinner of 1703 has been preserved.* The later Sir Francis was then Recorder. On the other hand, Yonge in his *Plimouth Memoirs* gives a full list of all the business engagements of the Mayor and Corporation, as they recurred annually; and also a list of the Corporate full dress days, "Mayor's Feasts, and other Treatments."† "The Fishynge Feaste" finds place in neither, and as Yonge wrote these lists before May, 1695, we get with the aid of the dinner bill aforesaid within some half-dozen years of its modern origin under direct Drake auspices.

It is indeed about this time that we find the first really substantial departure from the Drake story as embodied in the Official Records, and more or less confirmed by the contemporary evidence. Unquestionably the Drake of history had been for some time gradually passing into the Drake of popular sentiment; and the respect and admiration which were rightly entertained for his undaunted heroism, indomitable pluck, and untiring energy, had merged into a growing hero-worship, which later days has carried almost to apotheosis. To the ordinary Plymothians even of his own day, ignorant of what transpired within the Corporate conclave, not then a public body, he would have been the most prominent figure connected with "bringing in the water," and his memory was kept alive in connection with it through the long retention of the Leat Mills by his family. We should have been surprised if, when the Corporation of 1617 were commemorating Hawkins and Hele in their new Guildhall, Drake had been omitted. We are little surprised to find in the map which accompanies one of the siege tracts, printed in London in 1643, the leat set forth as "Sir Francis Drake's water;" we are not surprised to see his name for the first time publicly recognized in direct association with the water works when, in 1671, the Old Town Conduit was rebuilt, since the Corporation had at last come to their own, and in the

* In Jewitt's *History of Plymouth*, pp. 209-10, it is quoted in full.

† *Plym. Inst. Trans.*, vol. v. pp. 554-560.

rents of the mills were reaping a tardy reward for their patience and outlay. Standing on the firm foundation of the Corporate Accounts, we can see unmoved the gradual progress of a tradition which, by the accretions of generations, uncorrected by reference to record, and therefore free to fancy, was to develope into the full-blown myth since handed down.

Those who appeal to tradition against record should consider what it involves. The Spaniards said of Drake that he was "a devil and no man." In like manner Peele calls him "the dreadful dragon." Tradition says of him (and, unsupported by evidence, one tradition is as good as another), that he "brought in" the water by art magic, compelling a Dartmoor spring to follow his horse's tail into the town; and that as the water ran before his door he dipped his scarlet gown therein for joy, which probably accounts by imitation for the number of Corporate coat tails immersed at sundry Fishing Feasts of later date—if wicked rumour speaketh truly—after dinner. Tradition avers that he made fire ships by throwing chips of wood from the Hoe into the Sound; that he "shot the gulf" which divided this upper world from the antipodes by a pistol, painted in one of his portraits; that he threw a poor lad overboard lest the boy should turn out a cleverer man than himself; that he fired a cannon ball through the earth to save his wife from committing bigamy; that he rises to his revels when you beat his old drum at Buckland Abbey; that he is the "wild huntsman" with the "wish hounds" of Dartmoor; and that the only reason why Tavistock is not now a seaport is that the inhabitants would not grant Drake an estate on which he had set his heart! Strange that with all his philanthropy he should, if hearsay be true, have tried to drive such a hard bargain with his native town. What is the value of unsupported tradition in connection with a man whose memory is wrapped in such a cloud of legendary lore as this? Of all the Englishmen who have been reputed dealers with the devil, from Roger Bacon to Oliver Cromwell, there is not one whose memory has blossomed into such exuberant legend as Drake. This water myth is no isolated fancy, but has its place as an integral part of one inconsistent whole.

* Southey, in a letter to Mrs. Bray (*Tamar and Tavy*, ii., p. 34, 2nd ed.), points out that the miracle of leading the water is common in the lives of the saints, and that the Irish ones generally led it "up hill."

Side by side with these marvels we have statements of a more matter-of-fact every-day character, but founded upon nothing more substantial than this same shadowy popular faith.

Yonge in his *Memoirs** is the first writer who without limitation advances the Drake claims. In this work, written in the closing years of the seventeenth and opening years of the eighteenth century, he says that Drake "put up the Compas on the Hawe," and built "divers conduits," and that he carried out the Water Act to his "great Honor and the Inexpressible benefit of the town and Haven."† We have seen that Drake did not put up the Compass, and did not build the Conduits; and with all the facts before us it is easy to judge whether the bringing in of the water redounds more to his "great Honor" or to his business abilities.

Prince in his *Worthies*, published in 1701, in the main follows Westcote,‡ and practically adds nothing to the narrative. In fact he rather tones it down; for he sees the absurdity of the inhabitants sending their clothes a mile away to *dry*, and so substitutes *wash*. He says of Plymouth:—

This famous place before Drake's time was a very dry town, and the inhabitants were enforced to fetch their water and wash their clothes a mile from thence; but, by his skill and industry, he brought a stream many miles into the place. The head of the spring that thus waters the town is to be found no less than seven miles distant, in a direct line, but by circlings and indentings he brought it thirty, and that through valleys, wastes, and bogs; but what was most troublesome of all, through a mighty rock thought to be impenetrable. However, by his undaunted spirit, he, like another Hannibal marching through the Alps, who said *Aut viam faciam aut inveniam*, made the way he could not find, and overcoming the difficulty he finished the enterprise, to the continual commodity of the place and his own perpetual honour. And fine would have been the diversion, when the water was brought somewhat near the town, to have seen how the Mayor and his brethren in their formalities went out to meet it, and bid it welcome hither, and that, being thus met, they all returned together. The gentlemen of the Corporation, accompanied with Sir Francis Drake, walked before, and the stream followed after into the town, where it has continued so to do ever since.

* Vide *Plym. Inst. Trans.*, vol. v., p. iii.

† *Plym. Inst. Trans.*, vol. v., pp. 525, 527, 565.

‡ Topographical writers copy and repeat each other to an extent which makes them the most unoriginal class of authors known; but the repetition of a statement is no additional proof of its correctness, if the repeater has no added personal knowledge. Prince certainly had none.

Elsewhere Prince partly follows Fuller :

He [Drake] did that at his more leisurable minutes, and, as it were, by the by, which was sufficient to have eternized another's memory : I mean that great work ever to be recorded with praise, his bringing a running stream of water through all the streets of Plymouth from a vast distance off.

This involves, however, an assumption beyond Fuller ; for Prince is the only writer who—in plain defiance of all fact—credits Drake with distributing the water as well as providing it. And so the legend grows.

Cox's *Magna Britannia* (1720-1) remarks :

The streets are very compact, and well supplied with water brought in to them seven Miles, at the Expense of the great Sailor *Sir Francis Drake*, who was a native of the place.*

A Journey through England,† 1723, amusingly minimises the whole story by saying that the town

Is very well furnished with Water, which is brought in in Pipes at seven Miles Distance : A work worthy of that great man *Sir Francis Drake*, who sailed round the World in Queen Elizabeth's Reign ; and was a Native of this Town.

The Modern Universal British Traveller‡ being more complimentary is less exact.

The town is well supplied with water, which is conveyed from a spring seven miles distant. This convenience was obtained at the sole expense, and under the immediate inspection, of that great ornament of the English navy, *Sir Francis Drake*.

Rural Elegance§ (1768) :—

It is well supplied with fresh water, which was first brought hither from a place seven miles off, at the sole expense of *Sir Francis Drake*, who was born here.

And so we proceed, the tradition gradually gathering strength until Messrs. Britton and Bayley in their *Beauties of Devon*||

* P. 526. An MS. note in Mr. Prideaux's copy of this book in the Public Library (? his writing) comments "Incorrect ; *Sir Francis* acted here as the civil engineer, for which he was remunerated accordingly, as the Archives of Plymouth fully establish." When this was written the name of Lampen had not been recovered. The blunder of Drake's nativity has often been repeated.

† Vol. ii. 3rd ed. p. 64.

‡ p. 477.

§ p. 141.

|| p. 247.

distance all their predecessors. Not only do they say that by Drake's

Patriotic exertions the noble undertaking was entirely executed at his own cost; and various mills were also erected on different parts of the stream [a winding channel of nearly twenty-four miles in length] for the use of the town at his expense;

But they further aver that

In the reign of Queen Elizabeth, a new charter was granted to the town, through the solicitations of the famous Sir Francis Drake.

This I think the most marvellous Drake "fact" of all. That we find the town paid £220 for the charter is nothing;* but what must have been Drake's interest in Plymouth when he took the trouble to solicit the renewal of its charter five years after he was dead!

After this supreme effort it is hardly worth while to follow "tradition" further—for it only repeats itself. It is quite a small matter by comparison that B. R. Haydon† credits Drake with vesting the water in the Mayor and Commonalty, and that elsewhere we find that the completeness of the "inauguration" provided for the "gradual flow of the stream," which makes the Plymouth Leat even more remarkable in its physical characteristics than the wonderful waters of Robert Montgomery, which, according to him,

"Meander level with their fount."

As "Perambulator" humourously comments, "Whether the water was dammed back to keep pace with their worships, or whether their worships galloped along in double quick time to keep pace with the water, neither record nor tradition hands down to us."‡

We may, however, note what Barrow has to say in speaking of the obligations which Plymothians

Can never forget . . . they owe to Sir Francis Drake. . . . This work could only at this time have been conceived and accomplished by a man of his talents and ability, and in the short period of four winter months. The channel from the river Mew to the town is said to be twenty-five miles, but is reduced by the course pursued to eighteen miles.§

* It was "purchased" of Matthew Boyes for £170, having been by his "meanes and industrie" renewed; and the town had spent £50 on the suit before. † *Vide* "Sketch," *Naval Chronicle*, 1808.

‡ *Op. cit.* vol. iv. p. 159.

§ *Life of Drake*, pp. 418-419.

This is a statement which I am utterly unable to comprehend ; for it seems in defiance of Euclid to assert that a straight line is not the shortest distance between two points, or that the reduction from twenty-five miles to eighteen left matters pretty much as they were before. Barrow wrote clearly enough, on matters within his own knowledge, and there is, of course, here, some slip of the pen. It is only curious that Drake should be the subject of so many. We may be certain that if Barrow had had the evidence which we now possess before him, his wonder at the work and at the time of its execution would have been greatly lessened. Wanting the original authority, he had, like all other writers of later date, to fall back upon mere hearsay, and to repeat what he found in print already. For his main facts he studied the national records so far as they were then accessible ; for his local references he had no such aid.

Errors of long standing have peculiar vitality, and the almost unquestioned character of the Drake Water Myth over centuries has led it to be regarded with peculiar respect. A presentation of the facts, such as is here attempted, must however in the end lead to a restoration of the true historical faith, however reluctant many of us may be to abandon a long-cherished belief.

APPENDIX.

THERE are some interesting points in the accounts of the water property and Drake's connection therewith, given in our older guide books. No two agree !

The *Picture of Plymouth** states: "The inhabitants of the town are well supplied with fresh water, and are indebted for it to the famous Sir Francis Drake, by whose skill and exertion it was brought in a channel from the river Mew, on the borders of Dartmoor by a devious course of nearly 24 miles. Prior to this period they had to rely wholly upon the springs of the town, which afforded an inadequate supply when the town increased in size and population. The water has ever been vested in the Mayor

* (Mr. Henry Woolcombe), pp. 8, 9. (1812.)

and Commonalty . . . Another advantage attending the bringing of this water to the town was its enabling the corporation to erect corn mills."

The *Panorama of Plymouth* takes a more pronounced view: "To the munificence and enlightened exertions of our countryman, the renowned Sir FRANCIS DRAKE, Plymouth is indebted for a perennial and ample supply of fresh water. That enterprising navigator, whose versatile and commanding genius was the wonder of his contemporaries, conquering obstacles at that time deemed insurmountable, conducted the stream from the skirts of Dartmoor, by a circuitous course of twenty-four miles. The Act of Parliament for this purpose received the sanction of his royal mistress in the twenty-seventh year of her reign."*

The *Tourist's Companion* printed by Johns, of Dock, in 1823, follows the *Picture*; and this is the case with the later edition of that work, to which the name of John Sandford is prefixed.

R. Brindley, in his *Directory*, is the first of our local topographical writers who seems to have suspected the truth, endorsed in the main by "Perambulator," but incapable of plain proof until the recovery of the missing book. He says the water "was conducted by the renowned circumnavigator of the globe, Sir Francis Drake, at the expense of the corporation, and not at that of the engineer, as has hitherto been asserted, he being remunerated for his services, and also receiving compensation for cutting through some portion of the ground which he possessed; the same being made to other possessors through whose grounds the water flowed."†

Nettleton's *Guide*‡ simply says, "Plymouth is supplied with water by a rivulet or leat, which conducts from a source on Dartmoor, twenty-four miles distant. . . . This good work was effected pursuant to act of 27th of Elizabeth, by Sir Francis Drake; and a contest has been for some time actively carried on between John Collier, Esq., M.P., and the Corporation, as to the right of the latter in the *property* of the water." Without expressing any opinion on the "merits of the arguments," "the humble author of this humble book" remarks "that they have involved a decided case of 'spirits and water' occasionally conducive to moral inebriety."

* (Rev. S. Rowe), pp. 4, 5. (1821.)

† p. 12. (1830.)

‡ (G. Wightwick), p. 30. (1836.)

The *Plymouth and Devonport Guide* states:— "Plymouth is abundantly supplied with water, by a fine leat, which was first brought into the town in the reign of Elizabeth, by the renowned and patriotic circumnavigator of the world, Sir Francis Drake. This stream is diverted from the river Mew, just above Sheepstor bridge, on the skirts of Dartmoor, and winds a circuitous route of twenty-four miles."*

■ H. E. Carrington. (1837.)

NOTES ON CHARLES KINGSLEY: HIS LETTERS AND MEMORIES OF HIS LIFE.

SYLLABUS OF LECTURE BY MR. PENGELLY, F.R.S.

(Read March 31st, 1881.)

PREFATORY. The herring fishers' religious service at Clovelly. Storms at Clovelly. Habit of sketching. Making quotations. Poetic licence. Dissenters. Regarded with distrust. Getting on. Self-education. Snobs, clods, and jackanapes, &c. How to acquire thorough knowledge. Visiting the poor. Belief in physiognomy. *Essays and Reviews*, and young men. Drawing of a mammoth. Meteors and meteorites. Antiquity of man within the tropics.

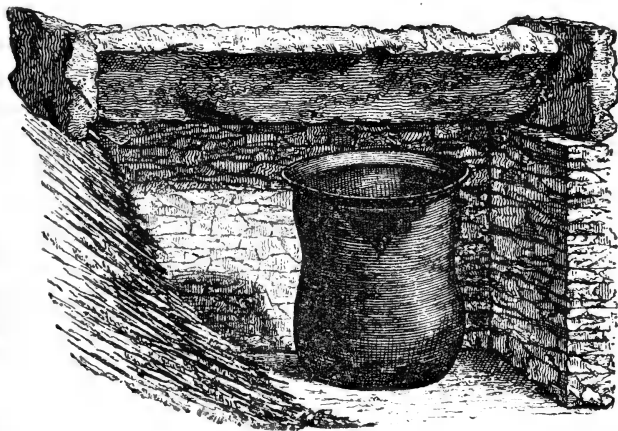
ON THE DISCOVERY OF AN ANCIENT GRAVE IN STILLMAN STREET, PLYMOUTH.

BY MR. FRANCIS BRENT.

(Read at the *Conversazione*, January 13th, 1881.)

DURING the alterations that have been made by Messrs. Thomas Pitts and Son on the premises in Stillman Street, preparatory to the erection of their new malt-house, an interesting discovery was made of a little grave containing an urn, which once held the ashes of the burnt body of one of the early inhabitants of Devonshire. The workmen, in excavating for the foundations of the iron pillars that were to support the respective floors, came upon some shells—mostly those of the oyster, periwinkle, cockle, and mussel—all very much corroded and decayed, so that many of them could not be preserved, indicating that they had been buried for a great number of years, and that probably they were part of an ancient refuse heap. The shells were not in very large quantity, but similar shells were scattered throughout the adjoining soil, showing that the heap had been disturbed in former years, and the contents distributed. In clearing further there were found two flat stones, which were taken to be the covering of some old drain. These were each about three feet long by fifteen inches broad and three inches thick, and consisted of what is known as dunstone—not the slate of the district, but a hard green rock, which had been brought from a distance—and had the appearance of having been much weathered before they had been used for their present purpose. The stones were placed at a right angle to each other, thus forming a roof, the gable ends of which were crossed by two pieces of stone, each about a foot long, of similar description to the cover stones. On raising the stones a large urn, composed of black ware, was discovered, placed in a small grave or cist, which was about eighteen inches deep by two

feet wide and three feet in length. This had been excavated in the native rock, which was here soft and shaly, similar to that which appears in so many of our drainage excavations. Unfortunately, no one was on the spot to record what I have since learnt from the workmen employed; and soon the grave was cleared out, the urn destroyed, and the *débris* carted away to some ballast heap, whence it has been taken on board ship and lost. When I first saw the grave it had been completely emptied, and on the west side a flat stone to support the iron pillar had been inserted, thus destroying all evidence of what that side had originally been, although I was informed that it consisted of the native rock. The grave lay nearly north and south. The east and south ends had been built



up of small slabs of dunstone, and were quite perpendicular, whilst the north end consisted of the native rock, sloping away at a considerable angle, and exceedingly decayed and shattered. It is not improbable that the north and west sides were originally as perpendicular as the rotten rock would admit of, but that in excavating the soil the labourers had removed all the loose stuff, which was carted away with the rest, leaving the rock at the angle at which it had most readily broken. From the few fragments of the urn which I was able to preserve the drawing of the restored figure has been prepared. This may not be absolutely correct; but at all events it will enable us to form some idea of what this interesting urn was like, wherein were placed the ashes of the cremated body of one

of Plymouth's ancient forefathers. That it once contained ashes cannot I think be doubted. The portions of the bottom still present a white appearance, which probably arises from the contact of the ashes with the burnt clay. I may add, however, that no human bones were brought under my notice, so that if any were found, as has been stated, they have been carted away and lost. It is much to be regretted that further excavations could not be made, which might have led to further discoveries, and perhaps more careful observations than could now be recorded; but the nature of the new building would not admit of this. Much soil and soft rock were removed, but nothing of further interest was discovered, although I visited the spot several times daily. The urn itself, in its restored figure, presents a somewhat unusual form, and differs from that of most vessels found in kistvaens or barrows in its larger diameter at the mouth (13 inches) in proportion to its height; it is also very thin. It was placed with the mouth upwards in the grave. A fragment of an urn, nearly allied to this, except in its smaller size, was found by the Rev. Mr. Kirwan, in July, 1868, in a large barrow on Broad Down, near Sidbury. A drawing of the fragments, as well as of the restored urn, are given in the *Transactions* of the Devonshire Association of this year. The barrow is No. 57 of Mr. Hutchinson's list in the Report of the Barrow Committee, edited by Mr. Worth. Mr. Kirwan's urn was about half the size of the Stillman Street one. I am not aware that any grave similar to this has ever been recorded, and if not, this discovery may be considered as highly interesting. The Romano-British graves met with by Mr. Spence Bate on the hill near Fort Stamford were composed of slabs of stone, without roof cover, and contained many relics, but I think no cinerary urns, or other pottery, except what may be considered as food or water vessels. The barrows opened by Mr. Kirwan near Sidmouth rarely contained kistvaens, but the urns were usually enclosed with flint stones. The barrows opened and explored in Cornwall did not contain similar cists; and none opened elsewhere, as far as I am aware, contained cists with roof stones placed at right angles to each other as have been found in our Plymouth grave. The early Roman inhabitants of Britain, however, used tile graves, one of which, consisting of eight roof tiles, placed in a similar manner to the Plymouth one, and having a tile at each end like the stones at the end of ours, was discovered near York, and is figured in

The Celt, the Roman, and the Saxon, p. 308. This contained no urn or vessel, but a layer of charcoal and burnt bones—the remains of a funeral pile. Again, the urn from Stillman Street is of somewhat finer ware than those from British interments, and appears to have been made on a potter's wheel; nor do the fragments show any signs of lines or rude ornamentation on the outer surface, so common on urns from such graves, but exhibit all the tokens of having been subjected to the funeral fire, fragments of charcoal still adhering to their surface. This grave therefore, in all probability, did not contain the burnt bones of one of the aboriginal natives of Devon, but rather those of one who lived after the Romans had visited our county, and introduced one of their own modes of burial of their dead.

ON AN OSSIFEROUS FISSURE IN THE BATTERY HILL, STONEHOUSE.

BY MR. R. N. WORTH, F.G.S.

Read October 9th, 1879. •

IN my paper on the bone caverns of the Plymouth district, read before the Plymouth Institution in February, 1879,† I recorded the occurrence within a few weeks previously of fragments of bone from the remaining portion of a cavern in the Battery Hill, Stonehouse, which in the year 1865 had yielded to Mr. C. Spence Bate, F.R.S., remains of rhinoceros, horse, ox, and deer. Since then, at intervals extending in all over about two years, other finds have been made of a peculiarly interesting character. A full series of the most important specimens has been presented to our museum; and the object of this paper is to place upon record the circumstances under which the remains were found, and to give a brief description of their nature.

For many years past there had been visible on the southern face of the quarry a huge fissure extending from the surface of the hill-top to the bottom of the workings—a depth of some sixty feet—and probably much further. It ran at first approximately north and south, on the line of the north and south joints which are so well marked in this portion of the Stonehouse limestone, and was nearly perpendicular, but with a slight western underlie; subsequently it turned to the north-east, with an eastern underlie. It varied in width at different points from two feet up to ten or twelve. It was wholly filled with earth of a surface character, in parts of a stiff clayey nature, of which, in the course of working,

* This paper has been supplemented by the discoveries made since the above date, the full details of which are now incorporated to May, 1881.

† Vide *Trans.*, 1878–9, pp. 87–117.

many hundred cartloads had been removed. Adjoining to it, and opening into it, on the east, were sundry cavities—the largest about midway on the face of the artificial cliff, which were partially filled with earth evidently derived from the fissure, but which were partially empty—these cavities being apparently independent caverns, that, long subsequently to their formation, became side chambers to the main fissure by the removal of the rock partition between.

Concerning the length of this fissure I have no information; but it extended far to the southward, if not to the face of the original hill-slope bounding Millbay, which is at least probable. Its termination northward would be about midway in the hill. In the fissure and in the chambers at the side, principally in the largest, the remains described in this paper were found. It is not the cavern investigated in 1865 by Mr. Spence Bate, nor had it any connection therewith.

The leading characteristic of the discoveries in connection with this fissure has been the occurrence in small quantities, and spread over a comparatively long period of time, of the fragmentary remains of a fauna singularly varied for its quantitative extent, and the addition thereby to the cavern fauna of Plymouth of at least one species hitherto unrepresented in this locality.

With the exception of some of the smaller bones of the extremities, almost every bone found was more or less imperfect, and the bulk a mass of obscure or utterly unidentifiable fragments. But for the fact that teeth have been found in what by comparison may be termed considerable quantity, and that these for the most part are in a very perfect condition, little scientific value indeed would attach to the fissure and its contents at all.

Not only are the bones commonly mere fragments, but to a great extent they are also in such a decayed and friable condition, that it is very easy to account for the disappearance of the major part of the skeletons to which they belonged. Moreover, the earth in places was full of minute osseous particles.

There has been in many cases an association of remains which would show that the bodies of the animals originally found their way into the fissure intact, and that while there has been subsequent disturbance and redeposition after decay, it has not been so extensive as to scatter the relics of individuals very far apart. The term "individuals" is used advisedly, for in some of its more

important respects the osseous contents of this fissure have a markedly individual character.

Thus among the earliest finds were those of teeth and fragments of bones of the rhinoceros—of one animal only—and discovered, though at intervals extending over three months, scattered through the fissure-earth in tolerably close proximity. Next came the bear, again a single individual, but much more largely represented, the osseous fragments representing nearly every part of the skeleton.

So with the horse, the hyæna, wolf, fox, and boar—each also represented by single individuals, or if by more than one, by remains so curiously individualized as to include no duplicates, unless in the case of the boar, and the wolf—there is a doubt whether some of the teeth referred to the latter may not be those of a species of dog.

To a large extent the same appears to be true of the cervine remains; for while these indicate the occurrence of several deer, they show also the presence of differing species, though in the most important particular of all there was certainly at least a double representation.

The only genus which is at all widely represented is the bovine. More than a hundred bovine teeth of various ages and species, young and old, were found, but very few bones to match. Some of the teeth evidently belong to very young animals, and others to very aged; and *Bos primigenius*, and *longifrons*, and probably *Bison priscus*, are indicated.

With very few exceptions, the bones and teeth were simply scattered through the earth, and in no great quantity at any one spot, though retaining in many cases the special association indicated. A few, however, which had found their way into the side chambers, were partially encrusted with stalagmite; and there were also found one or two masses of stalagmite enclosing bones of considerable size, indicating the introduction of the bones in question into the cavity while the stalagmite was in process of formation (with or without their integuments), independently of such extraneous matters as earth or clay.

The association of the remains is of such an accidental character, and yet bears such a relation to the general fauna of the country at the date of the deposit, that there seems little difficulty in accounting either for their presence, or for the condition in which they were found. We have here evidently a tunnel cavern, eroded

until its roof fell in ; which then became an open fissure, subsequently filled from the surface, into which "some animals fell and were killed, and others retired to die ; where perhaps a few were dragged or pursued by beasts of prey ; whilst the rains of Devonshire washed in at least some of the bones of those which died near at hand on the adjacent plateau."* These words of Mr. Pengelly apply in the most complete sense to the conditions of this fissure on Battery Hill. The filling was of course gradual, and subsequently there was some disturbance caused by the breaking into, and partial filling of, the side chambers connected with the main cavity.

The remains found include those of *Rhinoceros tichorinus* ; *Ursus* (probably *ferox*) ; *Hyæna spelæus* ; *Canis lupus*, *Canis vulpes*, *Canis* (a small variety) ; *Felis catus* ; *Cervus elaphus*, *Cervus tarandus*, *Cervus capreolus* (?) ; *Bos primigenius*, *Bos longifrons* ; *Bison priscus* (?) ; *Equus fossilis* ; *Sus scrofa* ; *Ovis oi capra* ; *Lepus timidus* ; *Mus rattus* ; and a fragment of the dermal skeleton of a fish, near the head (? sturgeon).

* *Trans. Devon. Assoc.*, vol. ix. p. 440.

CONTRIBUTION TOWARDS THE FAUNA OF
PLYMOUTH.

BY MR. G. C. BIGNELL, M.E.S.

HYMENOPTERA; ICHNEUMONIDÆ.

Arranged according to the Rev. T. A. Marshall's Catalogue, published by
the Entomological Society of London, 1872.

PART I.

- ICHNEUMON *bilineatus*. Bred from *Bryophila glandifera*.
trilineatus. Bred from *Abraxas grossulariata*.
multiannulatus. Bred from *Noctua brunnea*.
confusorius.
gracilentus.
leucostigmus.
submarginatus.
nigritarius. Bred from *Abraxas grossulariata*.
coruscator.
jugatus. Bred from *Tephrosia extersaria*.
vacillatorius. Bred from *Depressaria heracliana* (12th August,
1878).
oscillator.
ridibundus. Taken at Laira.
- EXOPHANES *occupator*.
- AMBLYTELES *palliatorius*.
oratorius.
castigator.
funereus.
proteus. Bred from *Chærocampa elpenor*.
- TROGUS *lutorius*. Bred from *Sphinx ligustri* out of larva taken at
Stoke.
alboguttatus. Bred from *Orgyia pudibunda*.

Eurylabus dirus.

Phæogenes melanogonus.

ischiomelinus.

candidatus. Bred from *Tortrix viridana*.

trepidus. This is a new British species, and captured by myself at Widewell farm, 4th August, 1880.

Phygadeuon fumator. Plymbridge, 24th April, 1880.

vagans. Plymbridge, 5th May, 1880.

Cryptus lugubris.

analis.

rufiventris.

signatorius. Bred from an old bramble stem, 6th May, 1878.

Mesostenus obnoxius. Bred from *Zygæna filipendule* cocoons, in which they remain during the winter, and emerge from the middle to the end of June. (19th June to 3rd July, 1879.)

Hemiteles tenebricosus. Taken at Plymbridge, 5th June, 1880.

similis.

formosus. Bred from spider's eggs (*Agelena brunnea*), 14th July, 1878.

cingulator.

Agrothereutes hopei.

Hemimachus fasciatus.

Pezomachus zonatus. Bred from spider's eggs (*Agelena brunnea*), taken at Cann Wood.

procurorius. This is a new British species. I bred it last year (1880) from a larva feeding on oak in Cann Wood.

rufulus.

Henicospilus ramidulus.

Ophion luteum.

minutus. This is a new British species; captured at Laira.

Schizoloma amicta. Bred from *Eupithecia linariata*; larva taken at Laira on toad-flax.

Exochilum circumflexum.

Anomalon xanthopus. Captured at Bickleigh wood, 29th May, 1878.

ruficorne. Bred from half-grown larva of *Odonestis potatoaria*.

bellicosum.

clandestinum. Bred from *Hemithea thymiaria*, 12th July, 1880.

Trichomma enecator.

PANISCUS cephalotes.

testaceus. A parasite on *Dicranura vinula*.

tarsatus. This is a new British species, which I bred from *Eupithecia abbreviata*.

CAMPOPLEX mixtus.

pugillator. Bred from *Corycia temerata*.

CASINARIA vidua. Bred from *Abraxas grossulariata*.

tenuiventris. Bred from *Hemithea thymiaria*.

LIMNERIA albida. Bred from *Gonepteryx rhamni*.

difformis. Bred 8th May, 1879.

fenestralis. Bred from *Botys verticalis*.

majalis. Bred from an old oak-gall (*Cynips kollari*).

mæsta. Bred from *Hybernia progemmaria* and *defoliaria*.

obscura. Bred from *Hemithea thymiaria*.

unicincta. Bred from *Eupithecia rectangulata* and *Lomaspilis marginata*.

lugubrina. This is a new British species, which I bred from *Ecophora flavimaculella*, feeding on the flowers of the wild carrot growing on the cliffs under the Citadel (1879).

interrupta (Holmgr). New British species; captured 15th May, 1880.

vulgaris. New British species; captured.

clausa. New British species; bred from *Hybernia progemmaria*.

carbonaria. This is a new British species, which I bred from *Cidaria pyraliata*.

***MESOCHORUS gracilentus.** This is a new British species, which I bred from *Gonepteryx rhamni* larva, and I believe it to be an hyper-parasite on *Limneria albida*.

sericans. Bred from *Exorista vulgaris* pupa (a dipteron) out of *Abraxas grossulariata* larva.

fulgurans. Bred from a *Casinaria vidua* pupa out of *Abraxas grossulariata* larva.

semirufus. Bred from *Eupithecia castigata*.

sylvarum. Bred from *Apanteles* cocoons out of *Vanessa atalanta* larva.

olerum. Bred from *Casinaria vidua* pupa out of *Abraxas grossulariata* larva.

* This Genus appear to be hyper-parasites.

EXETASTES fornicator.

osculatorius. Bred from *Mamestra brassicæ*.

calobatus.

albitarsus.

BANCHUS pictus. Bred from *Selenia illunaria*, 15th March, 1881.
falcator.

MESOLEPTUS testaceus. Bred from *Eupithecia castigata*.

ECLYPTUS ornatus. Bred from *Tortrix heparana*.

MESOLEIUS hamulus. Maker, 5th June, 1880.

TREMATOPYGUS vellicans. Taken at Widewell farm, Tavistock Road, 4th August, 1880.

EXOCHUS alpinus. Bred from a *Tortrix* feeding on honeysuckle in May (possibly *T. xylostearia*).

BASSUS cinctus.

exsultans.

pictus.

nigritarsus. Bred from *Bombyx quercus*.

pulchellus.

cognatus.

festivus.

METOPHYS micratorius.

RHYSSA persuasoria.

EPHIALTES imperator. Taken at Bickleigh.

tuberculatus. Taken at Plymbridge.

PERITHOUS varius. Bred from an old bramble stem.

PIMPLA examinator. Bred from *Tortrix viridana*, 14th July, 1880 ;
also from a pupa found in an old burdock stem (29th April, 1879).

turionellæ.

flavonotata. Bred from *Tortrix viridana*.

scanica. Ditto ditto.

stercorator.

brevicornis.

GLYPTA ceratites.

hæsitator.

scalaris.

LISSONOTA caligata. This is a new British species, which I bred from *Anticlea badiata*. *Caligata* remains in the pupa state longer than its victim. I therefore presume it confines its attacks to *badiata*.

LISSONOTA *variabilis*.

bellator.

cylindrator.

PHYTODIAETUS *coryphæus*. Bred from *Tortrix viridana*.

RHOGAS *reticulator*. Bred from half-grown larva of *Odonestis
potatoria*.

circumsriptus. Bred from *Ebulea crocealis*.

MICROPLITIS *alvearia*. Bred from *Boarmia rhomboidaria*.

AGATHIS *nigra*. Plymbridge, 5th May.

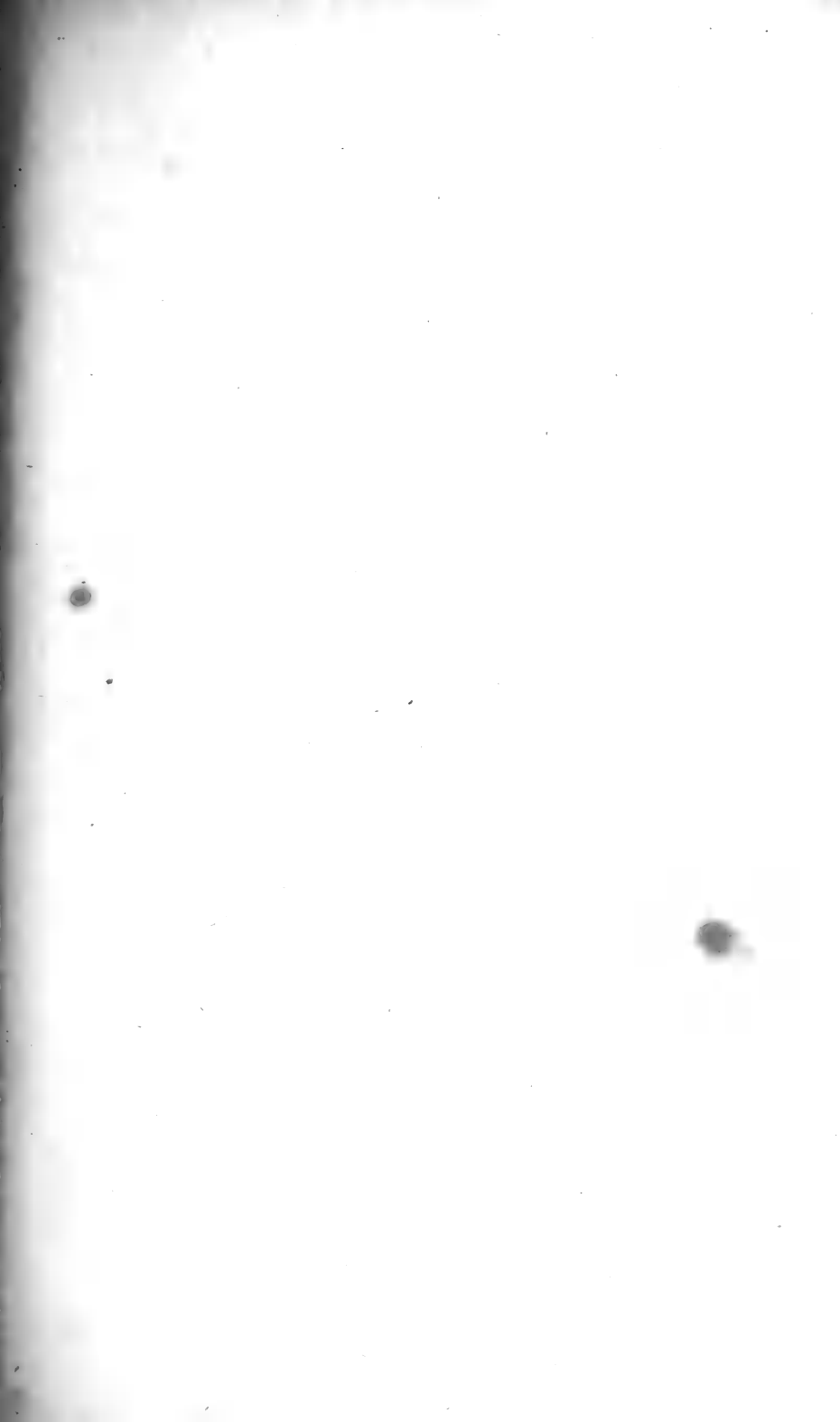
PERILITUS *atrator*.

HOMOLOGUS *discolor*. This is a new British species, which I bred
from *Cabera pusaria* (24th September, 1880).

MACROCENTRUS *linearis*. Bred from *Botys verticalis* and several
noctuæ.

7, CLARENCE PLACE, STONEHOUSE,

31st March, 1881.





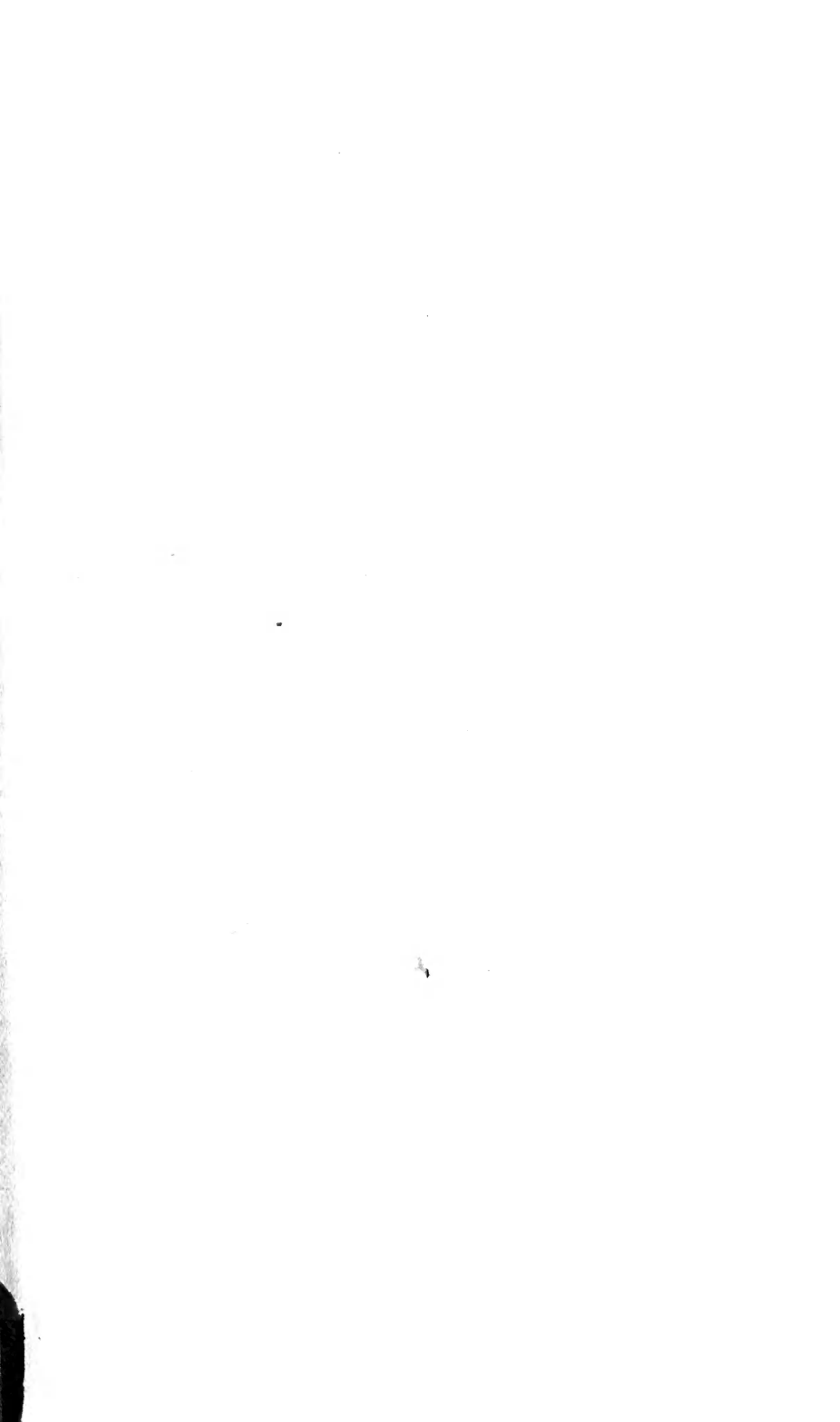
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The Stone Implements	FRANCIS BRENT.
Pyralidina of Plymouth	G. C. BIGNELL, M.E.S.

CONTENTS.

1880-81.

Message from the President.	J. BROOKING ROWE, F.S.A., F.L.S.
Technical Education.	J. C. INGLIS, C.E.
Samuel Cook.	W. EASTLAKE.
Meteorology and Climate of Plymouth.	Dr. J. MERRIFIELD, F.R.S.
Sir Francis Drake and the Plymouth Corporation.	R. N. WORTH, F.G.S.
An Ancient Grave in Stillman Street.	FRANCIS BRENT.
Fauna of Plymouth: Ichneumonidæ.	G. C. BIGNELL, M.E.S.



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